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PATENTS FOR INVENTIONS.

ABRIDGMENTS

OF

Specifications

RELATING TO

AGRICULTURE.

DIVISION III.

AGRICULTURAL AND TRACTION ENGINES.

A.D. 1618-1866.

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PREFACE.

This volume contains the abridgments of specifications of inventions relating to " Agriculture, Division III.—Agricultural and Traction Engines," from the earliest date (A.D. 1618) to the end of the year 1866.

The series includes—

Motive-power engines for working agricultural implements and machinery.

Traction engines both for agricultural purposes and for use on common roads.

Endless travelling railways, impelling legs or pushers, and other aids to locomotion, when applied to traction engines.

Inventions relating to every part of a traction engine are included in this series; but in the case of agricultural implements combined with motors, only the engines have been dealt with. The descriptions of the implements themselves, whether separated from or connected to the engine, and of the various intermediate appliances, such as drums, pulleys, anchors, &c., through which motion is communicated from the engine to the implement, will be found in Divisions I. and II. of Agriculture, the former relating to field implements, and the latter to barn and farmyard implements.

A detailed list of the various kinds of inventions comprised in the present series of abridgments is furnished by the subject-matter index at the end of this volume.

It should be borne in mind that the abridgments are merely intended to serve as guides to the specifications, which must themselves be consulted for the details of any particular invention.

At the foot of each abridgment is stated the price at which a printed copy of the specification may be purchased at the Patent Office Sale Branch (38, Cursitor Street, Chancery Lane, E.C.)

By means of the " key " at page 20 of the List of Works at the end of this volume, the reader will be able to find out what series of abridgments contains any other class of inventions to which he may desire to refer.

H. READER LACK.

February, 1884.

INDEX OF NAMES.

[The names printed in *Italic* are those of the persons by whom the Inventions have been communicated to the Applicants for Letters Patent.]

Page
Adams, W. B......49, 152, 166
Alison, J.................131, 150
Allan, T..........................37
Allchin, W.......................39
Allen, E. E...............96, 156
Alleyne, J. G. N.............172
Anderson, Sir J. C......23, 44,
61, 70, 75
Appleby, C. J.................185
Applegath, A....................14
Armengaud, J. E..............46
Ashworth, J.......................3
Astbury, W.............149, 155
Austin, J.................106, 112
Aveling, T...97, 101, 104, 116,
141

Bacon, J. B.......................15
Balcombe, J. B.................65
Balderston, R. G..............71
Balk, W...........................49
Barclay, A........134, 139, 144
Barrans, J.......................88
Barrat, P. P. C.................26
Barre de Nanteuil, P. A. A.
de la 34
Batho, W. F....................152
Beadon, G.......................22
Beards, T........................98
Belleville, J. 178
Belpaire, A.....................104
Bentall, E. H. 41, 46
Bernier, A......................169
Biddell, G. A. 145
Bischoff, J.....................181

Page
Blackburn, I. 59, 91
————, R........59, 91, 148
Blanchet, A. P..................162
Blanchet, A. P................168
Blandy, F. T. L. 94
———, *H.*.........................94
Blinkhorn, T. 77
Bonnall, J...............149, 155
Bousfield, E. T. 115, 146,
154, 174, 183
Bowen, P. W..................177
Boydell, J.....................75, 89
Bray, W. 58, 87, 127
——, W. T. G..................87
Brennand, J.....................90
Brooman, C. E................186
————, R. A....64, 150, 175,
178
Bruckshaw, J. 172
Brunton, W.......................6
Burness, W......................93
Burrell, C...................62, 85
Burrows, J. 183
————, W.....................183
Burton, R.........66, 79, 83, 96

Callaway, G......................32
Cambridge, W. C. 55, 57
Carfort, H. M. J. le N. de..186
Carter, J. T....................102
Chandler, R. W..........54, 76
Chaplin, A................72, 101
Chapman, W..................155
Charlton, T......................63
Charnley, H.....................76

Page
Chauveau U. A...............186
Chellingworth, T. T..113, 121
Chrippes, T.....................38
Church, W......................16
Clark, D. K....................184
——, W.................152, 162
Clarke, T..............22, 29, 66
Clayton, N...............40, 105
Clive, J. H......................10
Coleman, H. S...............164
———, R.....................68
Cooper, A.......................32
Cope, J.........................159
Cowing, H......................32
Cowper, C. 92
Craven, J......................166
Creuzbaur, R.................181

Darley, W.....................111
Davies, G. 182
Day, W. 99
Death, E......................137
De Carfort, H. M. J. le N...186
De la Barre de Nanteuil, P. A. A..........................34
Desmarest, H. L. G.........169
Dickson, P....................142
Dorman, W. H. 92
Dorning, W. J..................99
Downie, J.....................143
Dumbell, J.......................5
Duncan, J. W..................53
Dwyer, E......................178

Eddington, W.................110
Edwards, D.....................94
Elvin, H..........................69
Etty, T. B........................61
Exall, W. 27, 35

Faulds, R. 140
Fisher, N......................180
Ford, H. W.....................48
Fourness, R. 3
Fowler, J...........37, 135, 161
——, J., junior...52, 54, 65, 66, 72, 77, 79, 83, 96, 133
——, W.........................53

Page
Fox, S..........................166
Freeman, M....................22
Fulton, H. H....................61

Garrett, R.................30, 31
Gedge, W. E. 173
Gellerat, E., et Cie...........165
Gibbs, J..........................14
Gilbert, J......................124
Giles, J. 100
——, J. W......................78
Gordon, D.........................9
Greig, D.................83, 133
——, D., junior................96

Hadley, C.......................80
Hall, C...............63, 81, 173
Hancock, F. L................117
———, J. L.................117
Hart, C..........................51
Hawksley, G..................122
Heathcoat, J...................12
Heaton, G......................11
——, J..........................11
——, R..........................11
——, W.........................11
Henry, M...............165, 169
Hilditch, J. B.................125
Hippisley, J....................41
Holcroft, H.....................56
Holland, J. H.................137
Homersham, W. C..........114
Hornsby, R. 33, 155
———, R., junior....86, 149
Howard, J........115, 146, 154, 170, 174, 183
Humphrys, E...................83

Inman, G........ 67

James, S. L...................176
——, W. H.....................13
Johnson, C.....................74
———, G.....................74
———, J. H......40, 43, 44, 46, 47
Jones, H.......................141
Jones, W. A..................142

Page
Keene, M. H.......176
Kelly, P.......42
Kirby, J. E.......120
Knowelden, J.......94
Kyle, D. D.......50

Lake, J.......177
——, W.......128
Law, D.......143
Leach, G.......119
Leahy, M.......90
Lee, Jesse.......126, 132, 136
——, Joseph.......50, 116, 123, 135, 140
——, J. W.......161
——, W.......140
Leggett, R.......33
Le Nepvou de Carfort, H. M. J. 186
Lester, W.......8
Lillie, Sir J. S.......25
Longridge, J. A.......54
Longstaff, R.......95
Loubat, J. A........175
Lovely, R.......39

McCollin, W.......53
McIvor, W. G........170
Mackenzie, A. R.......171
Macklin, W.......151
Maggs, O.......45
Markham, C. R.......170
Marsden, W.......153
Marshall, J.......125
Massey, W.......64
May, C.......33
Moon, H.......178
Moore, F.......1, 1, 2
Morel, A.......148, 157
Morton, A. G. E.......164
Motley, T.......29
Murray, M.......4

Nanteuil, P. A. A. de la B. de 34
Nepvou de Carfort, H. M. J. le 186
Newton, W. E.......142

Page
Nickoll, S. W.......16
Nicolas, J. L.......19
Nillus, I........182
Noddings, R.......133

Oliver, T.......54, 76
Osborn, J. T.......24

Palmer, J....... 3
Pape, J. H.......35
Parker, H.......82
Paterson, A. J.......105
Payne, M.......163
Peters, J.......132
Phillips-Smith, J.......185
Pierret, J. B........150
Pinkus, H.......18, 21
Pinney, J.......146, 154
Pope, J.......55
Pratt, M.......6
Pullan, A.......95, 128
Purkis, R. A.......32

Ramsey, D.......1
Rawlinson, H.......116
Remington, G.......65
Reynolds, J.......8
Richards, A. K........176
Rickett, T.......110
Roberts, A.......144
———, F.......144
———, W.......158
Robinson, J. B.......56, 62
Robottom, T.......60
Rolfe, A.......147, 150
Romaine, R....48, 71, 80, 108, 118, 131

Sager, W.......28
Salmon, P.......168
Savage, F.......139
———, W. P.......91
Savory, P. H.......122
———, W.......122
Schweizer, A........150
Scotson, E.......76
Selby, F.......130, 138
Shuttleworth, J.......40, 105

Page
Simonton, J..........120
Smith, J..........79
———, J. Phillips..........185
———, W..........66
Steevens, W.......... 164
Stenson, J..........28
Stevens, B. F..........116
Stevens, S..........116
Stirling, P..........100
Stubbs, F. H..........153
Syrett, W..........111

Taillendeau, A..........173
Taplin, B. D.......... 116, 123
Taylor, J..........84, 102, 107
———, S. L..........89
Teissier, J. B. S..........21
Thomson, J. S..........94
Thorrington, G..........75
Thurlow, J..........113, 121
Thurnham, C. H..........82
Tindall, T..........7
Tomlinson, J..........160
Travis, J. S..........109

Page
Triat, A. H.......... 21
Turner, E. R..........161
———, F..........161
Tuxford, W..........33

Underhill, W. S..........172
Upton, J..........17
Usher, J..........31

Varley, J..........22

Wagstaff, R..........68, 69
Watt, J..........2
Webb, T..........151, 161
Welch, J 70
Wenham, F. H..........106
Wildgosse, T..........1
Williams, J. A..........58
Wilson, J..........85
———, J. W..........124
Winder, R..........174
Worby, W..........54, 65, 72, 96

Yarrow, A. F..........125

AGRICULTURE.

DIVISION III.

AGRICULTURAL AND TRACTION ENGINES.

A.D. 1618, January 17.—No. 6.

RAMSEY, David, and **WILDGOSSE**, Thomas.—A means of making "Newe, apte, or compendious formes or kindꝭ of "engines or instrumentꝭ, and other pfitable invencons, "wayes, and meanes," "to ploughe groundꝭ without horse "or oxen, and to enrich and make better and more fertile, "as well barren beate, salte, and sea sandꝭ, as inland and "upland groundꝭ."

The patent also relates to other matters not connected with the present series.

[*No Specification enrolled. Letters patent printed, price 3d.*]

A.D. 1769, March 14.—No. 921.

MOORE, Francis.—"Machines or engines, made of wood, iron, "brass, copper, or other metal to be wrought or put in motion "by fire, water, or air, with a small assistance of horses or "manual labour, which will be very useful in agriculture, "carriage of persons, goods, and navigation, by causing ships, "boats, barges, and other vessels to proceed with more "swiftness."

[*No Specification enrolled.*]

A.D. 1769, June 19.—No. 930.

MOORE, Francis.—"Several multiplying levers or additions "of power that will expedite and extend motion and reduce

" vibration, by which power is gained without a proportion-" able loss of time, superior to what hath been yet practised, " which will be of great utility in agriculture, carriages, navi-" gation, mills, engines, and other things where mechanical " powers are or can be used."

[*No Specification enrolled.*]

A.D. 1769, July 13.—No. 933.

MOORE, Francis.—" Machines or engines, made partly of " wood and partly of iron, brass, copper, or other metal, and " constructed upon peculiar principles, capable of being " wrought or put in motion by force or power, without being " drawn by horses or any other beasts or cattle, and will be " very useful in agriculture, carriage of persons and goods, " and also in navigation, by causing ships, boats, barges, and " other vessels to move, sail, or proceed with more swiftness " or dispatch than usual."

[*No Specification enrolled.*]

A.D. 1784, April 28.—No. 1432.

WATT, James.—" Fire and steam engines."

One of the improvements relates to " steam engines which " are applied to give motion to wheel carriages for removing " persons or goods or other matters from place to place, and in " which cases the engines themselves must be portable." The outside of the boiler is of wood or thin metal strengthened by hoops, and the fire chamber is contained within it. " Cylindrical steam vessels with pistons as usual in other " steam engines " are used, and the piston is moved by " the " elastic force of steam." The steam after it has done its office is discharged into the atmosphere, or into a condenser made with thin metal plates, " having their outsides exposed " to the wind," or to a current produced by bellows, worked by the motion of the carriage. Sometimes engines with two cylinders are used, which act alternately; or engines " which " act forcibly both in the ascent and descent of their pistons." Motion is communicated to the axle-tree of one or more wheels of the carriage by means of the " circulating rotative " machinery " formerly patented by the inventor, or by racks and sectors acting on ratchet wheels on the axles. Two or more loose wheels of different diameters are placed to be locked on the axle and impart extra power for bad roads or steep ascents. The carriage is steered by altering the angle of inclination of its fore and hind wheels.

[*Printed, price* 1*s*. *Drawings.*]

A.D. 1788, November 6.—No. 1674.

FOURNESS, ROBERT, and **ASHWORTH**, JAMES.—" Steam- " or fire engine."

A steam engine is described which is mounted on travelling wheels, and is intended for " conveying or impelling " travelling carriages of every denomination." " The hind " part of the carriage on which the engine is fixed" " may " be separated from the fore part," and " connected and the " power of it applied to any other carriage of whatsoever " description, by bolts, chains, swivels, or other apparatus."

The engine and boiler are set on a frame supported by two pair of road wheels. Steam is admitted to the cylinders (of which there are by preference three) through a " rotative " cock," " into the barrel of which is introduced as many pipes " as there are cylinders, whose pin being hollow receives the " steam at its top." The cock is worked by a wheel upon it, which receives motion from the engine. A similar arrangement is adopted for the exhaust. A connecting rod from each of the piston rods is connected to a stud on a wheel geared to a wheel on the axle of the driving wheels, one of which is fast thereon. The exhaust steam is turned into a water tank from which the water is pumped to the boiler.

The carriage is steered by a lever handle working a pinion which gears with a spur wheel on the fore carriage.

The inventors refer to a previous patent (No. 1640, A.D. 1788), in which a method of marine propulsion is described.

[*Printed, 6d. Drawing.*]

A.D. 1799, December 6.—No. 2362.

PALMER, JOHN.—Agricultural machinery.

Amongst the apparatus described is a device for a hydraulic engine. This consists of a cylinder and piston, which is to be worked after the manner of a steam engine by water power. The invention specially relates to the valves employed for the purpose. This valve consists of a metal cylinder having a number of openings in one half of its length. An unperforated cylinder slides over this cylinder, so that it can be caused either to cover or to unclose the openings. The details of the way in which these valves are to be employed are not shewn.

[*Printed,* 10*d.* *Drawing.*]

A.D. 1802, June 28.—No. 2632.

MURRAY, MATTHEW.—" Combined steam engines."

The engine is portable, not " requiring any fixture of wood " or any other kind of framing than the ground it stands " upon." It is " transferable without being taken in pieces," and is available, among other applications " for irrigating " land or for the various purposes of agriculture."

The engine is mounted on a " cistern," on the top of which the cylinder is set vertically. Connecting rods from a cross beam on the top of the piston rod carry a similar cross beam below through which a pin on the face of a toothed wheel passes. This toothed wheel engages with an internally toothed wheel fixed on the side of the cistern, and its spindle is fixed in the face of a wheel on the end of the fly-shaft, the effect of the arrangement being to impart rotary motion to the fly-shaft. Motion is communicated from the fly-shaft by toothed gearing to a crank shaft working a lever which operates an air pump, a hot water pump and a cold water pump. The last named is placed within the cistern into which it pumps water, the water being apparently pumped therefrom by the hot water pump. The fly-wheel has a " circular section of the rim." The " above inventions and " arrangements " may be " extended to two cylinders, forming a double engine." The fly-wheel may be set on a vertical shaft connected by mitre gearing with the first motion shaft.

A slide valve for use in the engine is described. A flat plate with four or more perforations slides in a circular or straight direction upon a fixed flat surface with similar perforations; when an aperture in the slide corresponds or is opposite to an aperture in the fixed surface, a way is opened to the steam pipe; when a blank or solid portion of the slide is opposite an aperture it is closed. Springs are fixed to press the moving surface into steam-tight contact.

A sliding drum is described. "A screw that goes into the " hollow part of the cylinder" is "attached to the drum" " by a groove in the cylinder." "On the fly-wheel being " turned round, the screw" " draws the sliding drum along the " cylinders alternately," "and causes the ropes to be coiled " on and off the drum" " and prevents the coils from rubbing " against or wearing each other by lateral friction."

[*Printed,* 9*d.* *Drawing.*]

A.D. 1808, February 4.—No. 3106.

DUMBELL, John.—" Obtaining, producing, using and cultivating a motive power or force."

A peculiar kind of portable or travelling engine is described, which among other purposes may be used for drawing ploughs and other agricultural implements, as well as waggons and carriages. The engine may be connected to the implement either in front or behind. The engine is actuated by steam or vapour, produced by permitting water or any other suitable liquid to drop upon metal, which is kept at the most intense degree of heat that can be imparted to it. The steam or vapour acts on a series of vanes or flyers (similar to the sails of a windmill or the flyers of a smoke-jack), and causes the same to rotate together with the shaft to which they are fixed; and the motion of the shaft is transmitted through suitable gearing to the running wheels of the carriage upon which it is mounted. This carriage comprises an upright cylinder or case, with vertical shaft and sets of inclined vanes; a separate furnace is mounted on the carriage frame, and combustion is kept up by a pair of bellows; the fore axle is attached to a fore-carriage provided with steering apparatus, and the main axle and driving wheels are actuated through a clutch, interposed between two bevel wheels, kept in motion by an intermediate bevel wheel, which is fixed upon the lower end of the vertical shaft which carries the sets of vanes or flyers.

[*Printed,* 1*s.* *Drawing.*]

A.D. 1810, February 26.—No. 3309.

PRATT, Major.—" Performing various agricultural opera- " tions by mechanical powers."

The specification describes an arrangement which may be adapted to the frames of ploughs, carriages, &c. for propelling the same by means of any motive power engine mounted upon the carriage frame. Endless chains working over pulleys have arms pivoted to them; these arms at their ends carry spikes. The motion of the endless chains drives these spikes into the ground, and by their action drags forward the carriage. The specification also refers to the use of a windmill having harrows mounted on the ends of its arms. This appears to work horizontally and to be mounted on a vertical shaft upon a travelling carriage.

[*Printed*, 1*s*. 5*d*. *Drawings*.]

A.D. 1813, May 22.—No. 3700.

BRUNTON, William.—Steam engine for roads and railways, &c.

The specification describes a locomotive which is impelled forwards by legs or pushers to which motion is given by the engine. In the arrangement shown in the drawing the cylinder is horizontal. The piston rod is jointed to the upper end of the " leg," which is also jointed at the same point to a vibrating lever, the upper end of which is jointed to a frame mounted on the carriage. A rod jointed to this lever is also jointed to a horizontal sliding rack working on the top of the carriage, and this by a spur wheel between them works another similar rack, which gives motion by an arrangement similar to that above described to a second leg. Each leg is lifted by means of a strap fixed to it and carried over a pulley, rotated continuously in one direction; the end of the strap has a weight attached to it, and the friction is sufficient to raise the leg. The strap is narrow at one part of its length, and when this part runs over the pulley it rests only on a loose pulley set in a groove in the other pulley, so that it slips, and the leg falls to the ground. The legs are fitted with jointed feet.

[*Printed*, 7*d*. *Drawing*.]

A.D. 1814, June 18.—No. 3817.

TINDALL, Thomas.—Steam engines, &c.

Among the various inventions described is an apparatus for ploughing, reaping, etc. It consists of a carriage mounted on three wheels, of which the first is used as a steering wheel. On the hinder part of the carriage is mounted a steam engine of peculiar construction, which propels the carriage by means of legs or pushers acting against the ground behind. The engine may be either reciprocating or rotary. The fuel is supplied from a hopper, and "a pusher" which agitates the fuel so that it may pass to the fire, is kept in motion to and fro by the engine. The admission of air is regulated by a sliding door, and the current is increased by a fan turned by a small pulley on the engine shaft. At the other end of the boiler is a vessel for the heated air and products of combustion to pass up; and over it a pump to cause a draught. In this vessel a retort is fixed; into this coals are put to have their gas extracted by the heat from the flue. The gas is led into another vessel, and through water contained therein; or into a vessel with hot air; thence through pipes to give light where wanted.

The boiler is square, and has a round vessel in the middle of it with flues for heating it and the boiler. The vessel receives the steam from the boiler through a pipe; and by another pipe it receives "the steam, heated air, and com-" bustion," which is forced through the fire by a pump and mixed with the steam, before it enters the cylinder. The extra gas is also conducted into the vessel. After the compound vapour has moved the piston it is led into a case surrounding the cylinder, to preserve its heat, and is then carried by another pipe upon the arms of an horizontal wheel, fixed round the outer side of the case. The piston is attached to a cross bar, having a jointed lever hung at each end, the extremities of which are formed as racks, that work into a friction wheel passing up and down in grooves, and pull upward with the stroke and downward with the return stroke of the piston.

In the rotary engine, the outer cylinder is fixed, and has an abutment valve, and the inner revolving cylinder has "clappers" or hinged pistons, fixed on its convex circumference. Pipes lead into the circular channel from the boiler and condenser. The vapour, introduced between a "clapper" and the abutment generates the required motion. On the front part of the carriage is fitted a mowing or reaping apparatus. Below the hinder part of the carriage a plough or a harrow or a seed-drill may be fitted.

[*Printed*, 1*s*. 2*d*. *Drawing*.]

A.D. 1814, September 17.—No. 3841.

LESTER, William. — "Machine for separating corn and " seeds from the straw and chaff."

The apparatus may be driven by a portable steam engine, which conveys it from place to place, and works it at any required place. The engine is mounted on a wheeled frame, the wheels of which it drives by means of a double rack above and below a pinion on the axle of the hinder pair of wheels. The power to drive the separating machine is taken from a crank shaft. When the engine is to be put in operation, the hinder end of the frame is to be propped up, and the earth dug from under the driving wheels so that they may revolve freely.

The engine may also be mounted in a boat which it serves to propel.

[*Printed*, 1*s*. 5*d*. *Drawings*.]

A.D. 1816, January 9.—No. 3973.

REYNOLDS, Joseph.—"Construction of wheel carriages and " of ploughs and other implements used in husbandry, to be " moved by steam, heated air, or vapour."

The object of this invention is to propel or give motion to wheel carriages on ordinary roads, and also to apply the locomotive power of such carriages in drawing or working ploughs, rollers, harrows, and other cultivators and implements used in husbandry for breaking up, clearing, and sowing land, and also as stationary power for giving motion to thrashing, winnowing, and such like machines. The steam carriage consists of a strong rectangular wood frame, which carries a top frame, to which in order to maintain its horizontality when ascending inclines, the steam boiler is suspended from a transverse tubular shaft, which also serves to convey the steam to the pipes which supply a pair of horizontal engine cylinders, disposed on the main frame, one on each side the boiler; these pipes are appropriately curved, and in order to accommodate themselves to the oscillations of the boiler, have liberty to turn in stuffing box sockets at each end. The power is conveyed to the crank shaft by side connecting rods from crossheads mounted on the piston rods. The carriage is mainly supported by two very broad drums, which are actuated by toothed gearing and act as driving wheels; motion is imparted to them from the crank shaft through sets of differential gearing on an intermediate shaft, which according to the desired speed is brought into activity by means of crabs or clutches. Each drum axle is also provided with appropriate gearing for causing the drums simultaneously to revolve in opposite directions, for the purpose when necessary of turning the carriage, which in front is supported on a single guiding wheel, that has its axle in a swivelling frame. Brakes are applied to the drum wheels. No particular description is given either of the steam engine or the steam boiler. The cultivating implements are to be suitably connected to the carriage, and the thrashing and other machines are to be actuated by additional shafting appropriately arranged.

[*Printed*, 1*s*. 1*d*. *Drawing*.]

A.D. 1824, December 18.—No. 5056.

GORDON, DAVID. — "Carriages or other machines to be " moved or propelled by mechanical means."

An arrangement of mechanism is described for propelling a locomotive carriage over a railway or common road, or for propelling ploughs, harrows, or other agricultural implements. "This action is performed by the operation of a " number of rods or propellers; which rods or propellers are " attached at one of their extremities to a like number of " cranks, situated upon one common axis across the carriage, " near to the hind part thereof; whilst their outermost " extremities are formed as will be herein-after described, so " as to be capable of siezing the ground in a sufficient degree " to propel or drive the carriage or other machine aforesaid

" forwards, being at the same time connected by rods or " cords with the extremities of certain levers, which are " operated upon by an equal number of excentric shapes or " wheels" fixed upon one common axis. "On the apparatus " being set in motion by steam or other power, the rods or " propellers will be forced or thrown out backwards," and " by the form or shape of the eccentric wheels the outermost " extremities of the propellers will only remain in contact with the " ground at the time when they are moving with the " greatest velocity or nearly so; at other times the extremities " will, by the action of the excentric wheels, be taken up entirely " off the ground." The outer extremity of each propeller is furnished with an arched piece of metal or foot, the curved under surface whereof forms an arc of a circle, having the same radius as the circle described by the cranks which move the propellers. The under surface of each propeller foot is shod with "pieces of cork, short hair, whalebone, or other suitable " material, set on end like a stiff hard brush; the said substances to project a short distance beyond the points or " extremities of iron teeth. Thus if the flexible material " should yield in any considerable degree, the points of the " iron teeth aforesaid would come in contact with the ground " and would act as propellers to advance the carriage forwards." When the ground is covered with ice or hard snow, the feet are to be provided with steel points, which may project sufficiently to take hold of the ground and impel the carriage.

[*Printed,* 10*d.* *Drawing.*]

A.D. 1830, July 1.—No. 5950.

CLIVE, JOHN HENRY.—" Construction of and machinery for " locomotive ploughs, harrows, and other machines and " carriages."

The improvements relate to locomotive engines for railways, for common roads, and for use in drawing agricultural implements. They consist in making the driving wheels much larger than usual; in "applying the forcible action of the " engine" " at a greater distance from the centres or axes " of the wheels; and in driving only one such wheel " that wheel " bearing the principal part of the weight of the locomotive

" machinery, and being situated in the middle of the breadth " of the machinery." To allow for the longer stroke required the cylinders are increased in length, the area of the pistons being reduced in a corresponding degree.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1830, October 6.—No. 6006.

HEATON, John, HEATON, William, HEATON, George, and HEATON, Reuben.—" Steam engines for the purpose of " propelling and drawing carriages on turnpike roads and " other roads and railways."

The specification describes in considerable detail the arrangements of a steam engine for the purposes described. According to the wording of the description, however, the greater part of the mechanism described is not claimed by the inventors. The engine is supported on a pair of driving wheels and a pair of fore wheels fitted with steering gear. The boiler is tubular; waste steam is discharged into the chimney to assist the draft. The engine is fitted with slide valves worked by eccentrics, and the eccentrics are fitted with reversing gear. The steam supply is governed by a throttle arranged to be worked by the driver's foot. Motion is communicated from the crank shaft by means of spur gearing to a second shaft, and from this by connecting rods to a third shaft having a pinion thereon gearing with a spur wheel on the driving wheel. The second shaft is fitted with differential gear. The object of this arrangement is to allow the engines, &c. to be mounted on springs, while the motion is communicated to the parts which are not mounted on springs, and are consequently liable to shocks in passing over rough roads. The third shaft above mentioned is mounted on a frame carried by the axle of the driving wheels. Part of the gear for transmitting the motion to the driving wheels is ratchet gear. There are two ratchets, having their teeth in opposite directions, and a pawl can be caused to take into either ratchet. This arrangement allows the wheel on either side to overrun that on the other side when going round a curve, the pawl being shifted to one or other of the ratchets according as the engine is run forwards or backwards.

[*Printed*, 1*s*. 5*d*. *Drawings*.]

A.D. 1832, May 15.—No. 6267.

HEATHCOAT, John.—"Draining and cultivating land."

The apparatus is to be worked by steam or other power, and is intended for ploughing, rolling, harrowing and draining land. It is adapted for use on bog lands which cannot be conveniently tilled in the ordinary way.

A carriage of large dimensions is fitted with a steam engine or other motive power machine and suitable winding gear; it is mounted on a series of wheels, which conduct an "endless flexible floor, railroad, or way" within and upon which the carriage is caused to travel. This "affords a very "broad and extended surface for the purpose of sustaining a "carriage of great weight upon soft, swampy, boggy, or "unstable land." The "flexible floor" is made of painted or tarred sailcloth stretched on strips of metal. This carriage travels along a sort of roadway, formed across the bog and laid down in grass. A drain is cut at each side of this road and there are cross drains running into these. A boiler is mounted about the middle of the carriage, the steam cylinders being at the sides; motion is communicated from a crank shaft extending across the carriage in front of the boiler to the wheels carrying the "flexible floor." Motion is also communicated from the same shaft to winding drums at the sides by which tilling implements are drawn to and fro between the principal carriage and "auxiliary carriages" carrying pulleys over which the traction ropes pass. The fire-box may be of a size sufficient for burning peat, and the boiler may be supplied direct from the drains through suction tubes.

In some cases the carriage may be mounted on broad rollers or drums instead of the wheels and flexible endless floor. It may then be employed as a heavy rolling machine as well as for giving motion to the ploughs, &c.

The carriage may also be mounted on wheels "proper for "travelling upon land or soil of a sufficiently firm and com- "pact nature, in order to simplify the application of the "machinery and apparatus to the culture of such soils."

When required, the principal carriage may be moved to any place where the power of the engine may be used for working corn mills, thrashing machines, chaff-cutters, etc.

[*Printed*, 2*s*. 3*d*. *Drawings*.]

A.D. 1832, August 15.—No. 6297.

JAMES, WILLIAM HENRY.—" Steam carriages."

The drawings shew a traction engine. Three chain wheels are keyed on the crank shaft of the engine. These communicate motion to three similar wheels on a second shaft. The chain wheels being of different diameters, by clutching one or other of the wheels to their shaft different speeds may be given to the driving wheels, which are worked by chains from chain wheels on the second shaft passing over pulleys on the axle of the driving wheel. The clutches are worked by the driver's foot. The steering is effected by communicating motion through suitable gearing to a screwed shaft on which are nuts connected by links to the fore axle. A bar on the fore carriage is connected by chains to rods working cams which throw in and out of gear ratchets on the bosses of two of the chain wheels communicating motion to the driving wheels. The effect of this arrangement is that on the fore carriage being turned from side to side to steer the engine the driving wheels on one side are thrown out of gear. Band brakes are fitted to pulleys on the bosses of the last-mentioned chain wheels. The fire is blown by a blowing machine worked by the engine. The boilers are constructed of "plates or masses of iron (or other suitable metallic sub" stance) throughout which are made a series of tubular " apertures or cavities arranged in parallel lines," the boiler being built up of a sufficient number of such tubular plates, and these being arranged in various ways in connection with water chambers. A double or single acting pump is arranged to produce a circulation of water through the boiler. The carriage carries a large water tank communicating by tubes with the boiler. "At each stage of the journey of the car" riage a supply of water should be kept boiling over a " sufficient quantity of ignited fuel, to propel the carriage " through the next stage, and suitable arrangements should " be provided for the immediate transfer of the boiling water " and ignited fuel into the boiler of the carriage." A surface condenser is used consisting of tubes set in a copper tank containing water. The condenser communicates with the boiler through an " intermediate vessel." To fill the boiler from it, the connection between the boiler and the intermediate vessel is cut off, and the steam of which the intermediate vessel is full is condensed by turning the blast of air from the blower upon it. A partial vacuum being thus produced, water from the condenser flows into the vessel and from thence, the communication being opened, into the boiler.

[*Printed*, 2*s*. *Drawings*.]

A.D. 1832, September 29.—No. 6318.

GIBBS, JOSEPH, and APPLEGATH, AUGUSTUS.—" Steam " carriages."

The steam carriage may be employed for drawing other vehicles after it. The boiler is tubular. On the top of the steam chest is a chamber into which the exhaust from the cylinders discharges. From this chamber the waste steam passes to the chimney. The cylinders are oscillating; the ends of the piston rods are fitted with friction pulleys which run in parallel guides fixed on the cylinder casing. Two pinions on the crank shaft of different sizes gear with two spur wheels loose on the axle of the driving wheel. Either of these loose wheels can be clutched to the axle, so that two speeds can be given thereto. The axle is connected to the body of the carriage by means of springs, which springs are connected to the carriage body by means of shackles at their ends to allow of a certain amount of play. The driving wheels are at one end of the carriage body, and the other end is supported on a steering wheel operated in the usual manner. Within the boiler is fitted an "apparatus for separating the " steam from the water." A circular copper plate with a hole in the middle is fitted across the boiler, and is bent downwards into a conical form. Above and below this is a metal funnel. The object of these funnels is to return into the lower part of the boiler any water that may strike against the circular plate, while steam passes up between the plate and the funnels. When the engine is used for drawing passenger carriages the steering apparatus may be fitted on the passenger carriage instead of on the engine frame. The method of operating the slide valves is described. A spindle rocks in bearings mounted on the valve chest. On this spindle is a cross-piece having two studs upon it. On the spindle also is an arm jointed to a connecting rod on each side, which connecting rod is fixed to the end of the slide rod. A fork on the lever is arranged so as to embrace either of the studs before mentioned, and according as this fork engages with the upper or the lower stud the valves are set in the position for driving the engine forward or backward. Instead of the boiler being tubular, it may have a series of cones projecting into the flue, the insides of the said cones being open to the water space. In the tubular boiler the products of combustion pass down through the tubes which extend to a level below the fireplace and thence up into the chimney.

[*Printed*, 1*s*. 9*d*. *Drawings*.]

A.D. 1835, March 11.—No. 6785.

BACON, JOSEPH BUTTERS.—(*A communication.*)—" Locomo-" tive steam carriages, applicable to railways and common " roads."

The engine is a reaction one, and consists of a pair of hollow arms to which steam is admitted and is ejected from side openings at their ends. By this means motion is given to the shaft on which the hollow arms are fixed. The apparatus is fitted within a cylindrical casing, so that the motion of the arms may be assisted by the steam as it issues reacting against the inner surface of the casing. The motion of the shaft is communicated by means of spur and friction gearing to the driving wheel, the last wheel of the train being a friction pulley which works against the rim of the driving wheel. Certain of the friction wheels are mounted on a lever arm by means of which they can be brought into closer or less contact with the wheels they drive. The engine is supported on running wheels in front and behind the drivers. The bearings of the hind wheels slide in guides, and by means of a lever arrangement acting against the sliding blocks the hinder part of the carriage can be raised so as to throw more of the weight on the front wheels. The front wheels are used as steering wheels, the carriage on which they are mounted being capable of being turned from side to side by an arrangement of levers. At the bottom of the smoke pipe a recess is constructed for the purpose of receiving cinders carried into the smoke pipe by the draft. The tank and the boiler are connected by tubes, so that "the pressure of steam

" in both vessels may be equalized, while the water is drawn " or allowed to run through the latter into the boiler."

[*Printed*, 6*d*. *Drawing*.]

A.D. 1835, March 16.—No. 6791.

CHURCH, WILLIAM.—Propulsion of carriages, vessels, &c.

Part of the invention relates to a locomotive engine for common roads. The furnace is fitted with a chamber above it, into which the fuel is introduced through a hopper, so that the coal becomes coked. The gases evolved are carried down to the furnace below and burnt there. When the coking is complete the fuel is allowed to fall into the furnace. The fire bars are tubes filled with water in connection with the boiler; the cylinders are vertical, the piston rods have rollers upon them running in fixed guides; the crank shaft communicates a to and fro motion to cranks on a second shaft, and other cranks or levers on this shaft are joined by connecting rods to smaller cranks on the axle of the driving wheels which thus receives a rotary motion. On one of the shafts is mounted a brake wheel surrounded by a strap, which can be tightened by a lever worked by the driver's foot. In the steam pipe are two throttle valves, which are opened and closed at each stroke of the engine by levers worked from the engine. The valves are closed by springs. These levers are worked by tappets in a circular plate, and by turning this plate the time which the valves remain open can be regulated, and the amount of steam admitted to the cylinders thereby regulated. Suitable gear is provided for shifting the plate as required. The cylinders are also fitted as usual with slide valves.

[*Printed*, 8*s*. *Drawings*.]

A.D. 1835, August 10.—No. 6877.

NICKOLL, SAMUEL WILSON. — " Rendering condensing " steam engines portable and applicable as a means of " general transport on rail and other roads."

The specification describes a railroad locomotive. The boiler is of the sort described in No. 6897, A.D. 1835. There are two cylinders, the piston rods of which are attached to a cross-head, which works the air-pump. Motion is communicated from the crank shaft to the hinder pair of running wheels by endless chains. The water of condensation and the condensing water are discharged upon a " refrigerator " composed of layers of hair cloth or other suitable fabric with spaces between. Air from a cowl passes through these spaces and is thence conducted to the fire. The water which leaves the " refrigerator " is " sufficiently cool for all the purposes of " a condensing engine."

[*Printed, 5d. Drawing.*]

A.D. 1837, November 4.—No. 7458.

UPTON, JOHN.—" Generating steam power and applying the " same to ploughing, harrowing and other agricultural pur" poses."

The water heating tubes are arranged vertically in a serpentine form, like the figure 8, and placed between two series of tubes slightly curved. The inner and outer tubes are connected and communicate at their lower ends with a small cylinder and open at their higher ends into another cylinder. The under fire place is formed on the lower bend of the serpentine tubes, and the flame and smoke from this rise between the tubes and among the fuel of the upper fire-place, made where the serpentine tubes cross each other. The whole is enclosed in an iron casing. The steam is collected and drawn from the upper cylinder. The engine is a rotary one and consists of an inner and an outer cylinder with the shaft passing through the centre of both. The inner revolves, and carries four sliding pistons, each attached by a rod to that on the opposite side of the cylinder; by means of an eccentric surface on the under side of the outer cylinder each piston is made to recede into a channel in the inner cylinder, while the same movement forces out the corresponding piston on the opposite side of the cylinders, and by the impulse of the steam therefrom the cylinder is rotated. The boiler and engine are fixed on a four-wheeled carriage, which is to travel over the land drawing after it the ploughs, harrows, or other agricultural implements. The hind wheels are bolted to two short cylinders, which turn freely on the hind axle of the carriage. On the inner end of each short cylinder there is a cog-wheel, which gears into a pinion on the axis of the rotary engine, and thus motion is given to the hind wheels. Either wheel can be disconnected in order to enable the carriage to turn in a small space.

[*Printed*, 9*d*. *Drawing*.]

A.D. 1839, August 26.—No. 8207.

PINKUS, Henry.—" Applying motive power to the impelling " of machinery."

This invention consists principally in giving motion to agricultural implements and machinery by " pneumatic " atmospheric auxiliary power " and " gaso-pneumatic power."

The first-named is generated by means of a partial vacuum and by the pressure of the atmosphere; the vacuum being induced by stationary prime movers, such as steam-engines, water-power, etc.

The "gaso-pneumatic power" is produced by the explosion of mixtures of carburetted hydrogen or similar gas and atmospheric air in close chambers, so as to act against pistons and put them in motion.

The patentee proposes to lay down a system of pipes or mains and to connect the same with a central station which contains an apparatus for producing a vacuum in the pipes, or a gas-holder to supply the pipes with gas. The pipes are provided with branches, to which the locomotive engines used for working the implements are temporarily connected. These engines are suitably constructed for being worked by means of a vacuum and atmospheric pressure, or by the explosion of gaseous mixtures. They resemble generally steam locomotives. With the pneumatic engine two cylinders with open heads for the free ingress of the atmosphere may be used. The gas engine has double-acting gas and air pumps, two cylinders connected with two globular explosion chambers having igniting slides and safety valves. Ordinary expanding or metallic conical expanding pistons are used. The latter are solid discs with diameters less than those of the cylinders, round the rims of which discs a ring of platinum is fixed so as to form the frustrum of a cone loosely fitting the cylinder. These cones are slit longitudinally in several places, so as to expand, and thin short plates of platinum are made to cover the slits. On the frame of the engine there is a revolving drum, carrying a flexible tube by which the cylinders are put into communication with the fixed pipes. When the engine moves along the field, the drum revolves, so as to wind up or unwind the flexible tube. The drum and flexible tube may be removed, and the engine furnished with a receiver which is to be exhausted of air or charged with gas by being connected by a short flexible pipe with one of the branches.

Instead of working the engine by a partial vacuum and the pressure of the atmosphere, it may be actuated by compressed air, supplied by means of the long flexible tube and drum. The forward motion of the engine may be assisted by the employment of a rope or chain, fastened at a given point and passing round a pulley fixed on a wheel which is caused to rotate by the power of the engine. For marshy lands, a metal rim may be bolted on the periphery of each wheel; and an endless apron of wire-gauze may be stretched round the wheels.

The engines, instead of travelling over the land and drawing the implements after them, may be used for giving motion to endless ropes or chains to which the implements are attached. The engines may also be employed for putting thrashing machines, corn mills, etc., into operation.

The implements may be of the ordinary construction, and connected to the engine in a suitable manner, or they may be of "certain modified forms."

If the engine is to be used for digging or excavating it is furnished with a set of spades, to which the requisite movements are given by excentrics.

[*Printed*, 4*s*. 2*d*. *Drawings*.]

A.D. 1840, January 1.—No. 8331.

NICOLAS, John Leo. — "Constructing and propelling "carriages on railways or common roads and through fields "for agricultural purposes."

1. The power of a steam carriage to effect its propulsion is applied by legs, furnished with feet shod with iron soles similar to horse shoes. A transverse shaft is caused to rotate by the engine, and thereby motion is imparted to a transverse series of levers, which have their fulcrums on a bar, the ends of which are fixed respectively to the carriage side frames, to

one end of each of these levers a propelling leg is jointed, and the other end of each lever carries a counterbalance weight. As the shaft revolves, a corresponding series of arms radiating therefrom come in succession upon the ends of their respective corresponding levers, which force down the legs so as to press their feet flat upon the ground, in which position, being severally jointed to their respective legs, they remain while forcing the carriage forward; as the ends of the arms by turns clear the ends of the levers, the legs are raised by the counterbalance weights, and swinging forward are ready to take up a fresh position on the ground.

2. In "marshy and boggy situations, where wheels would " sink into the soil" "a kind of moveable and portable rail- " way or road is employed." "It consists of a number of " boards with raised sides, and having their upper surface " roughened for the purpose of giving the feet or shoes of " the pendant arms, before described, a good hold." "These " boards, after being used for supporting the pendant levers, " are raised from the ground by a peculiarly shaped com- " pound lever, and are carried forwards to the front of the " machine by means of a travelling endless cloth, furnished " with hooks and passed over rollers, one of which is situated " at the front part and the other at the back part of the " machine. The boards brought forward in this manner are " to be lowered in front of the carriage by means of a com- " pound lever, similar to the one employed for raising " them from the ground. At the time that the lower ends " of the pendant wheels are acting against any particular " board, the running wheels of the carriage are passing " over that board, which is thereby prevented from slipping " away."

3. This head relates to working the radial slides of a rotary engine, which comprises an outer fixed cylinder, and an inner revolving cylinder fixed concentrically upon a central axis; a piston block attached to the periphery of the inner cylinder, when driven by the steam pressure, gyrates round in the annular space formed between the two cylinders, whilst the two radial slides are by turns projected across the annular space to form fixed abutments to receive the backward pressure of the steam; the inward radial motion of these slides is alternately imparted to them by levers jointed to the piston

rod of a small reciprocating engine cylinder, which is mounted upon the engine casing, and is actuated by the waste steam. Their outward motion is produced by a cam on the main axis. The steam valves which govern the induction and eduction passages, are operated by the mechanism, and means for reversing the direction of motion are provided.

[*Printed*, 1*s*. *Drawings*.]

A.D. 1840, Sept. 24.—No. 8644.

PINKUS, HENRY.—"Applying motive power to the impelling "of machinery."

The Specification deals with numerous applications of electricity. Among the other inventions described is a method of using electricity as a motive power for agricultural purposes. Batteries are disposed in tanks below the surface of the ground, and from these insulated wires are led over the farm. A locomotive engine, similar to one described in No. 8207, A.D. 1839, has mounted on it a drum on which wires are wound, these being in electrical connection with the wires from the battery. The inventor says:—"To the "locomotive engine" "I apply an electro-magnetic engine, "namely, any well-known and effective electro-magnetic "engine or machine capable of imparting motion to ma"chinery; for example, Taylor's (patented) electro-magnetic "engine," or one described in the Specification. It is not stated particularly which engine is intended. An electro-magnetic beam engine is described in which magnets act alternately on a "flexible armature." The other engines described appear to be of the sort termed by the inventor "gaso-pneumatic."

[*Printed*, 6*s*. 8*d*. *Drawings*.]

A.D. 1845, March 27.—No. 10,578.

TEISSIER, JOHN BAPTISTE SIMION, and TRIAT, ANTOINE HYPPOLYTE.—"Propelling vessels, carriages, and agricultural "machines."

Locomotives, carriages, ploughs, &c., are to be propelled by a series of legs or pushers acting against the ground. One or more transverse crank shafts are fitted to the frame of the carriage, &c., and the pushing legs are mounted on the cranks. Motion is given to the shaft from an engine on the frame.

[*Printed*, 1*s*. *Drawings*.]

A.D. 1845, July 29.—No. 10,789.

BEADON, George.—Propelling vessels and carriages.

Part of the invention relates to the application of steam for propelling land carriages. These carriages may be used for drawing other carriages. Each carriage is supported upon a pair of " spiral frames ; " these frames have set upon them a number of small wheels and rollers which bear upon the ground.

The object of this arrangement is to combine "the direct " action of the rotary wheel with the oblique action of the " screw." Motion is imparted to the frames by means of a crank on each of their axles, which is worked by a connecting rod from a steam engine on the frame of the carriage. Instead of the " spiral frames " drums may be employed, on each of which are set a series of small wheels, forming a helical line around the periphery of the drum.

[*Printed*, 2*s*. *Drawings*.]

A.D. 1846, February 11.—No. 11,077.

CLARKE, Thomas, FREEMAN, Mark, and VARLEY, John. —"Obtaining and applying motive power."

Part of this invention relates to the application of the motive power obtainable from atmospheric pressure to work machinery for tilling land. The exhausting apparatus is to be placed in the centre of the estate or farm, and may be actuated by a steam-engine, watermill or windmill. The apparatus is connected with a main line of tubes laid down on a road passing through the centre of the estate. Branching off from the main tube or pipe, and at right angles to it, are several smaller pipes, placed about a quarter of a mile apart, which communicate power to as many engines, suitably constructed for being put in motion by atmospheric pressure. Each set of ploughs or other agricultural implements is worked by two engines, placed on opposite sides of the plot of ground to be tilled, and communicating with the exhausted branch pipes at the sides of such plot. The ploughs are drawn over the land in opposite directions alternately by means of ropes connected to a drum on each engine.

[*Printed, 7s. 6d. Drawings.*]

A.D. 1846, June 29.—No. 11,273.

ANDERSON, Sir JAMES CALEB.—"Improvements in ob-"taining motive power, and in applying it to propel "carriages and vessels, and to the driving of machinery."

The following portions of the invention relate to the present series:—

1. Causing the rotation of "power wheels" having, radially fixed, a circumposed series of water cylinders fitted with pistons and communicating diametrically in pairs, so that by a constant successive transference of the water to one side of the wheel, the preponderating weight shall keep the wheel in motion the impulse of which is applied to the propulsion of carriages and vessels, and to driving machinery. The lifting of the water is either to be effected mechanically or by creating a vacuum in the cylinders as they severally come uppermost, which may be effected by putting them in succession into communication with the condenser of a steam engine, or with an exhausting apparatus.

2. A locomotive is described for use on railways or common roads. A vertical boiler is mounted upon a frame at the rear of the main axle; a "power wheel" occupies the central space, and sends a current of air into the otherwise closed ash-pit. A pair of oscillating steam cylinders actuate a crank formed on the power wheel axle, whence from each end respectively lever arms transmit the power by means of connecting rods to crank pins on the driving wheels.

3. A vertical steam boiler is described; it consists of an outer and an inner shell, which latter forms a lofty furnace chamber, and contains a series of vertical plates, so fixed to the sides of the furnace, as to form alternate water spaces with intermediate narrow flues. The steam space is an annular chamber fixed on the top of the boiler concentric with the chimney, which is supported by a top plate and surrounded by an inverted conical chamber, through which the "exit

" steam is caused to pass, in order to rarify it, and thereby " to render it transparent."

4. A method of ploughing by steam is described. A steam carriage, fitted with a vertical boiler, carries a winding drum upon the axle of a " power wheel " which axle is set in motion by an oscillating steam cylinder. The ploughs are connected to the back of the carriage. The boiler employed is of the kind described in (3). Round the drum a rope is passed, both ends of which are led forward and attached to anchors of special construction. The engine winds itself up to one of these anchors, while the other anchor, as the rope attached thereto is slacked off, is drawn forward by horses, etc.

[*Printed*, 1s. 4*d*. *Drawings*.]

A.D. 1846, July 23.—No. 11,304.

OSBORN, JOHN TULLOH.—" Power machines or machinery " for tilling, draining, and otherwise cultivating land."

1. Two locomotive engines are caused to traverse the land on temporary rails, laid in parallel lines at right angles to the direction in which the furrows are to run. Each engine carries two drums on the side nearest to the other engine; and to these drums are attached chains or ropes, by which carriages, fitted with ploughs or other implements, are simultaneously drawn across the field in opposite directions, each carriage pulling after it the rope or chain by which it is to be drawn back again. This return rope is attached to an " out-" rigger " projecting from the side of the carriage, so that the rope is laid down in the line which the carriage is to follow in the next traverse. Thus while one drum on each engine is at work winding up its rope, and so putting the ploughs or other implements in motion, the other drum is delivering out its rope in readiness for the return operation. After each traverse of the ploughs or other implements, the engines are moved forward by means of a chain or rope, one end whereof is attached to an anchor laid out ahead, and the other end to a drum connected with the crank shaft of the engine. As soon as the second plough has reached the portion of land already tilled by the first, the ploughs, etc. are drawn up an inclined plane attached to the back of the engine, and carried forward a sufficient distance to bring them

to fresh land. The "outriggers" used for the last traverse are of sufficient length to lay the rope in the line required.

The bearing wheels of the engines are grooved on their peripheries to adapt them for use on common roads or on rails. The rails are of tube, and screw one into another.

2. Where the fields are bounded on two sides by canals or ditches, with a sufficient depth of water, the engines are placed in boats or punts. Some special implements for use with the engines are described.

[*Printed,* 1*s.* 2*d.* *Drawings.*]

A.D. 1847, October 14.—No. 11,907.

LILLIE, Sir John Scott.—" Machinery applicable to tillage, " and for other agricultural purposes."

1. A machine for tilling land consists of a frame or carriage to which the ploughs, harrows, or other implements are to be attached. It has two sets of wheels, placed at right angles to each other; one set supporting the carriage while the implements are in action, and the other set, which can be lowered or raised, sustaining the carriage when it is shifted sideways, in order to bring the implements into operation upon a fresh portion of the land. On each side of the carriage there are two "square staves or skeleton drums," over which passes an endless railway, formed of wooden planks or wrought iron plates hinged together, and on this the bearing wheels of the machine travel. A double mould or ridge plough is fixed to the carriage, so as to precede the wheels and clear a path for them. Motion is communicated from one of the bearing wheels, by toothed gearing, to an axle extending horizontally across the carriage. On this axle are fixed tilling implements. The machine may be driven in various ways, preferably by a high-pressure steam engine fitted on the carriage frame. This drives a drum round which a rope is passed, this rope being kept distended by a grapnel on each side of the field. Instead of transverse wheels being employed for moving the machine sideways, the carriage may be hauled on a light platform, placed on rails at right angles to the bearing wheels, and moved sideways by a "contrivance similar to what are " termed crabs used by builders." "Or in order to render " frequent operations of this kind the less necessary, shafts

" or arms may be extended at each side of these carriages, " to which a variety of agricultural implements may be " attached, and by which means three ridges may be acted " upon by the carriage being moved backwards and forwards " in the same tracks as frequently as may be necessary for " this purpose." When the weight of the engine is too great for the nature or state of the land, the carriage is to be drawn across the field by a steam engine at each side, alternately winding up a rope or chain attached to the carriage; such engines moving on temporary rails along the headlands. Or only one steam engine may be used, with an endless rope passing round the engine drum or whelp wheel at one side of the field, and round a pulley, carried by a platform mounted on wheels at the other side.

[*Printed*, 1*s*. 2*d*. *Drawings*.]

A.D. 1847, November 25.—No. 11,977.

BARRAT, Pierre Phillipe Célestin. — " Machinery for " tilling and working land."

The invention relates to a locomotive engine behind which is attached a frame carrying digging implements. These implements resemble mattocks, and have a suitable motion given to them by a connecting rod attached to a lever worked from the crank shaft. The boiler is tubular. The cylinders are oscillating. " The expansion is regulated by hand by the aid " of a simple lever" "which changes the place of the slide " in relation to the admission valve." On a second shaft driven from the crank shaft are two fly-wheels, which may be used for communicating motion to other machinery when the engine is used for such purposes, the digging machinery and the travelling wheels being thrown out of gear. The travelling wheels have two movements, one for use when digging is going on, and the other for moving the engine from place to place. This is effected by an arrangement of different sized spur wheels, which may be thrown in and out of gear as required. The travelling wheels are driven by chains running over chain wheels connected to their axles. Tension pulleys are arranged so that they can be forced down on the chains, or raised from them so as to allow the chains to run loose. By this means the wheel on either side can be driven, and the other left free to assist the steering of the engine. The springs are arranged in "the form of a parallelogram." The steam chest is formed of two large tubes leading into a chamber. The object of this is to prevent priming.

[*Printed*, 2*s*. 5*d*. *Drawings*.]

A.D. 1848, March 8.—No. 12,080.

EXALL, William. — (*Partly a communication.*) — Steam engines, boilers, &c.

Part of the Specification describes improvements in thrashing machines. The steam engines described are employed principally for driving such machines. The first one is "a " modification of that description of engine known as Brunel's " engine." In this a pair of cylinders inclined to one another work on the same crank, or one works on the crank and the other on a pin connected to the crank pin. The object of this is to avoid lengthening the crank pin. The driving shaft may be connected by a universal joint to the driving shaft of the thrashing machine. Each piston is fitted with two rods which carry a cross head, the central portion of which forms the pin on which the lower end of the connecting rod works. There is a recess in the top of the cylinder to allow the lower end of the connecting rod to descend below the top of the cylinder, and a corresponding recess is made in the piston to allow the piston to come close up to the cylinder top. The object of this arrangement is to obtain a longer connecting rod. The slide valve is fitted with an expansion valve on its back. An arrangement is described for altering the positions of the excentrics. A rack has motion given to it by a screw or otherwise. This rack gears with a pinion, on the shaft of which is a bevel pinion gearing with a bevel toothed arc formed on the face of the excentric.

Some improvements are described in "the rotatory steam " engine, commonly known as Hiero's engine," which is intended to drive the thrashing machines. Steam is admitted at the axis to a pair of radial arms, and discharged from openings at their ends. Openings are made on both sides of the arms, and valves are fitted to them, so that by the use of the valves the steam may be permitted to escape on either side, and the arms consequently caused to rotate in either direction. Gearing is arranged to reduce the speed to that required.

A portable boiler is described. There is a single cylindrical flue above the fireplace, which is surrounded by a concentric water-space, through the lower part of which radial tubes lead and communicate with a space between the internal and external shells. From this space the products of combustion pass to the chimney. The fire may be fed from the top, or through a tube fitted for the purpose in the side.

[*Printed,* 1*s.* 9*d.* *Drawings.*]

A.D. 1848, July 18.—No. 12,217.

STENSON, Joseph.—" Steam engines and boilers."

Part of the invention relates to the transmission of power for working thrashing machines and other agricultural machines. A portable engine is employed to condense air which is forced through a long flexible hose into an " emission " wheel," from which the machine to be worked is driven. The emission wheels work by reaction, the steam or compressed air being admitted to the axle, conducted through hollow arms to the rim, and then suffered to escape through inclined openings. In one part of the specification an arrangement of two such wheels is described. "The opposite " faces of the two wheels are indented after the manner of " the buckets of an overshot water wheel, and consequently " the steam emitted from each wheel is projected against the " bucket faced periphery of the other, causing each wheel to " serve as a fulcrum for the steam of the other to act " against."

[*Printed,* 2*s.* 6*d.* *Drawings.*]

A.D. 1848, September 15.—No. 12,269.

SAGER, William.—Generating steam, conveyance by land and water.

The first part refers to an improved boiler. There are several series of fire bars, one above the other, with intermediate rows of water tubes. Water may be injected into the tubes by perforated pipes running along the length of the tubes. The hot water cistern forms a shell or casing surrounding the boiler.

Several modifications of a steam traction engine for common roads are described. (1.) A sort of drum is used as the driving wheel. This, with the engine, is mounted in a frame which can be tilted from side to side. The central part of the drum is cylindrical and the sides are bevelled, so that as it is turned to one side or the other, it steers the carriage accordingly. (2.) The engine and driving wheel are mounted in a frame which is turned to one side or the other for steering by a pinion and circular rack. (3.) The carriage is impelled by legs pushing against the ground. These may be fitted direct to the ends of the pistons, or the pistons may operate eccentrics from which the motion is given to the legs.

The rest of the invention relates to the propulsion of boats on canals, &c.

[*Printed,* 3*s*. 2*d*. *Drawings*.]

A.D. 1849, March 14.—No. 12,514.

CLARKE, THOMAS, and MOTLEY, THOMAS. — Obtaining motive power, steam traction on common roads and railways, &c.

The first part of the invention relates to improvements in steam generators, and obtaining a circulation of the water by mechanical means.

The second part relates to steam carriages for common roads. Such carriages may be steered by mounting the wheels so that they can vibrate on the axle, by means of a socket on the axle, on which the wheel runs. A lever is fitted to the socket so that the wheel can be set at any angle required. The levers of a pair of wheels may be connected and operated simultaneously by a handle or by the power of the engine. Motion is given to the driving wheels from an intermediate shaft driven by the engine, this intermediate shaft being supported on "radius bars" mounted on the driving wheel axle and the main shaft. The motion is given by bands. The frame of the carriage is of hollow tubes which serve as the condenser. The other improvements seem to refer only to steam passenger carriages.

Among other machines an excavating machine is described, but it is not stated that it is to be used for agricultural purposes.

[*Printed,* 4*s*. *Drawings*.]

A.D. 1849, July 7.—No. 12,698.

GARRETT, Richard. — "Agricultural implements and "engines."

The improvements in agricultural and other engines are described under the following heads; (1) boilers; (2) arrangement of the engine and boiler; (3) governor.

1. Two sorts of boilers are described. In the first sort the products of combustion pass along "two crescent shaped "flues" from the fire-box at the end and thence back along a circular flue to the chimney, which is close by the fire-box. In the second sort the boiler consists of "two or more distinct "vessels," bolted together. These vessels may be of various shapes, but the boiler figured and described is constructed as follows:—There are three circular vessels. The first contains the fire-box within it, and has on it the steam chest. The second consists of "an outer case furnished with tubes "inserted and secured in plates which form the ends of the "vessel." The third vessel "composes the smoke box of the "boiler, and is enclosed by a water space at the end." The chimney passes out through this vessel. A pipe connects the bottom of the first vessel and the top of the second, which is similarly in communication with the third.

The water is supplied to the third vessel, and the object of the arrangement is that the temperature in the three vessels may vary according to their respective distance from the fire-box, "thus presenting successively to the departing heat a "vessel or vessels of progressively decreasing temperature."

2. The engine and boiler are separate, being only connected by the steam and water pipes, so that the boiler can be detached from the engine. The cylinder "is placed "vertically beside the boiler" and is bolted to the bed-plate.

3. The governor described consists of a horizontal bar with fans at the ends mounted so as to have "vertical and rotary "motion" on a vertical spindle driven from the engine; friction rollers on the horizontal bar run on inclined planes carried by a disc keyed on the spindle. As the speed increases the increased resistance of the air on the fans causes the rollers to run up the inclined planes and the bar rises, operating the throttle valve in the usual manner.

A.D. 1849, ... No. 12,698*.

GARRETT, Richard.—Disclaimer of parts of the invention described in No. 12,698, A.D. 1849. The portions disclaimed refer to thrashing machines, and have no connexion with the subjects included in the present series.

[*Specification printed*, 3*s*. 4*d*. *Drawings*.]
[*Disclaimer*, 4*d*. *Drawings*.]

A.D. 1849, July 18.—No. 12,710.

USHER, James.—" Machinery for tilling land."

This invention consists, first, in "mounting a series of " ploughs in the same plane around an axis so that they " shall come into action in succession" and secondly, in " applying power to give rotatory motion to a series of ploughs " or other instruments for tilling land, so that the resistance " of the earth as the ploughs or other instruments enter and " travel through it shall cause the machine to be employed."

The machine consists of a steam carriage, the fore part whereof is carried by a pair of ordinary wheels, and the hind part is supported by a broad roller or cylinder and a pair of wheels of like diameter. The roller extends from one wheel to the other, and is fixed on the same axle, which is caused to rotate by gearing connected with the crank shaft of the engine and thus to impart a slow progressive motion to the carriage. The roller is removable at pleasure, so as to render the "bearing parts suitable to the different stages of " cultivation to which the machine may be applied." A lever frame at the back of the carriage supports a transverse horizontal shaft which is driven by gearing from the crank shaft at a greater speed than the hind axle; on this shaft five plates are fixed parallel to each other, and at equal distances apart. To each plate are attached three ploughs of a curved form, suitable for penetrating the soil in the opposite direction to that in which the machine is advancing, and for elevating and turning over portions thereof. The ploughs are so arranged with relation to each other that two ploughshares will not enter the earth at the same instant. If preferred, each set may be carried by a separate shaft.

[*Printed*, 9*d*. *Drawing*.]

A.D. 1849, November 24.—No. 12,860.

CALLAWAY, George, and PURKIS, Robert Allée.—Ploughing land, &c.

Amongst other matters the Specification describes an apparatus for ploughing land. A travelling carriage has mounted upon it a frame carrying endless bands working over rollers. These bands carry ploughshares upon them, which by an arrangement specially described plough up the land in a transverse direction as the carriage travels forward. Motion is imparted to the travelling bands by a shaft and bevel gearing from a steam engine mounted on the carriage. The same engine is also caused to communicate motion to the travelling wheels by means of chains and chain wheels. An arrangement of spur gearing is provided by which two speeds can be given to the wheels. The engines are mounted upon the part of the frame carrying the ploughing apparatus, which is not rigidly fixed to the carriage frame. The boiler is on the carriage frame, and the steam is supplied to the engines through a flexible or jointed pipe.

[*Printed*, 1*s*. 1*d*. *Drawings*.]

A.D. 1850, January 11.—No. 12,924.

COOPER, Alfred.—Steam engines, &c.

A portion of the invention relates to a method of applying steam or other power to the driving wheels of locomotives for railways or common roads. Motion is communicated from the crank shaft by means of spur gearing to a spur wheel fixed on the driving wheel on each side, or it may be by an arrangement of pulleys and bands. The spur wheel on the driving wheel is almost as large as the wheel itself. It is preferred to employ oscillating cylinders.

[*Printed*, 1*s*. *Drawings*.]

A.D. 1850, January 17.—No. 12,930.

COWING, Henry. — "Improvements in obtaining motive "power, and in steam and other ploughs, in land carriages, "in fire engines, in raising water for draining and other "agricultural purposes, and in apparatus for evaporating "saccharine and other liquors."

[*No Specification enrolled.*]

A.D. 1850, April 30.—No. 13,065.

MAY, Charles, and LEGGETT, Robert. — Agricultural machinery.

A steam engine may be mounted on the framing of a thrashing machine, so as to drive the drum of the machine direct. The engine is supplied with steam from a boiler at some distance through a steam pipe covered with felt, &c.; the object of this being to prevent risk of fire. Small engines may also be employed in different parts of farm buildings, these engines being supplied with steam from a boiler at a distance, or " a steam engine may be used in the locality of " the boiler to obtain vacuum, and the several engines placed " in localities of the machinery may be worked thereby."

[*Printed*, 2*s*. 9*d*. *Drawings*.]

A.D. 1850, July 3.—No. 13,165.

HORNSBY, Richard. — Farm implements, machinery and engines.

The last part of the Specification describes briefly an engine adapted for agricultural purposes.

The inventor says :—" The drawing shows the construction " and means of combining the various parts, and as these are " separately old and well known it is not necessary to enter " into a particular description thereof." " It will be seen " that the steam cylinder is fixed within the steam boiler and " fire-box, or in another chest formed on the boiler," and this combination is part of the improvement. The pump is at the bottom of the chimney or upper part of the fire-box. There is an apparatus in the flue of the boiler, having numerous holes, by which air from the ash-pit is supplied to the fire on the bars. Various implements and machines are described.

[*Printed*, 6*s*. 8*d*. *Drawings*.]

A.D. 1850, July 4.—No. 13,168.

TUXFORD, Weston.—" Applying steam power to agricultural " machinery."

The invention also relates to other agricultural apparatus. As regards agricultural steam engines the chief object is so to

" arrange steam machinery that the engine of a portable " steam engine may be enclosed within an engine house, so " that it may be shut up and kept as free as may be from grit " or dust and from the weather, and from being touched." The engine figured and described has a horizontal tubular boiler with the fire box at the end as usual. The cylinder, &c. is enclosed in a domed casing at the end of the boiler. The cylinder is an oscillating one, set vertically. It operates a crank shaft above which carries a fly wheel at one end and a driving pulley at the other. The governor is set on the top of the casing, and its shaft passes down into it. It appears to be the only part of the engine not enclosed within the casing. The engine appears to have no arrangements for self-locomotion, but is fitted with a pair of shafts for horse traction.

[*Printed*, 2*s*. 10*d*. *Drawings*.]

A.D. 1850, November 2.—No. 13,309.

DE NANTEUIL, PIERRE ANTOINE AUGUSTE DE LA BARRE.—(*A communication.*)—" Propelling carriages."

The invention relates to a steam carriage for common roads which may be used to drag other carriages after it. Propulsion is given to the carriage by means of a system of "kneed " levers;" the knee or curved part of the lever rests against the ground. On its shorter arm are a pair of rollers which clip a rail on the frame of the carriage. Its longer arm is jointed to the piston rod of a steam cylinder. There may be a pair of steam cylinders, and apparently one or two of the levers on each side of the carriage. When the lever is forced back by the action of the piston the lower of the pair of rollers bears against the under side of the rail, and the lever being forced against the ground the carriage is driven forward. When by the action of the piston the lever is drawn forward the upper roller runs along the rail, the lever being slightly raised from the ground. The carriage is supported on two pairs of running wheels, the hinder pair of which are loose and the front pair used for steering. A special arrangement for this purpose is described. Each wheel is mounted in a fork, the stem of which is swivelled in the fore carriage and has a horizontal lever fixed thereon. Studs on the ends of these levers work in slots in a cross-piece pivoted on a vertical stem in the centre of the carriage. This stem has a horizontal handle thereon, by turning which sideway movement is imparted through the system of levers to the wheels. The pair of cylinders are operated from a single valve box, the opposite ends of the cylinders being placed alternately in communication with the steam supply and the exhaust. The effect of this is to operate the levers on each side alternately and thereby impart a continuous propelling motion to the carriage. The piston rods are shewn as connected to racks which gear with a spur wheel on a vertical axle. It is stated that "in regard to the transmission, the choice may be had " between the rectilinear motion of the rods of the pistons " with their prolongation, or the circular motion of the " wheel."

[*Printed,* 1*s.* 3*d.* *Drawings.*]

A.D. 1851, October 23.—No. 13,786.

PAPE, John Henry.—Ploughs, &c.

Part of the invention relates to the application of motive power to ploughs as an auxiliary to horse traction.

On the plough body is mounted a drum which runs on the ground. Within the drum are the boiler, furnace, &c. The steam pipe passes through the axle of the drum to the steam cylinder which is mounted on the frame in a radial position as regards the drum. The steam only acts on one side of the piston, which is brought back by a spring. The valve is a rotary one and is operated by studs on the face of the drum striking against other studs on the face of a bevel pinion which gears with another pinion on the valve spindle.

Instead of steam a gunpowder engine may be used. Charges of powder are introduced into a cylinder by means of a "small roller or valve." The charge is fired by a lamp below a touch-hole which is opened by the same roller.

[*Printed,* 9*d.* *Drawing.*]

A.D. 1851, December 1.—No. 13,836.

EXALL, William. — Agricultural implements and steam engines.

The following improvements refer to the present series :—

1. Steam boilers. There is "an external casing surrounding "the body of the boiler and communicating with the smoke "box," "so as to form a return flue, through which the "heated gases from the fuel pass in their way to the chimney." The cylinder or cylinders are set within the smoke box and thereby exposed to heat.

2. Governor. A small double acting force pump is set to pump water or other fluid into a cylinder with a piston working therein, and furnished with an outlet cock. If the pump is worked too fast, the liquid accumulates in this cylinder, the piston is forced back, against the pressure of a spring which keeps it down, and its rod operates the throttle valve.

3. Slide valve. Method of relieving the back of the slide from steam pressure. A ring on the back of the slide is, by means of another ring sliding thereon, and bearing against the face of the cover, made to work steam tight against the cover. An aperture in the cover admits air within the ring to the back of the slide.

4. Condensing a portion of the exit steam. "A descending "branch pipe is carried from the blast pipe to a chamber or "vessel through which the feed water from the tank passes to "the feed pump, and the steam coming in contact with the "water, a portion of the steam is condensed and the tem-"perature of the water is proportionably raised."

5. "Two trunk engines set at right angles or nearly so" act on a single crank.

6. "Travelling engines for agricultural purposes" are mounted on two wheels only "with adjustable crutches at "either end of the machine to support it when in action."

7. "Arrangement of the parts of a fixed engine for agri-"cultural purposes," "in which the whole of the working "parts are comprised within or supported upon a cylindrical "frame." This is figured, but not described.

[*Printed*, 1*s*. 1*d*. *Drawings*.]

PATENT LAW AMENDMENT ACT, 1852.

1852.

A.D. 1852, October 1.—No. 106.

ALLAN, THOMAS.—" Propelling."

The inventor describes various applications of springs to paddle wheels, screw propellers for vessels and driving wheels of locomotive engines for railways and common roads. The part of the Specification which refers to the present series runs as follows:—" In applying my improved system of " construction to the driving wheels of locomotive engines, I " make the spokes of springs, and in some cases the tires " also, either wholly or partially. The spring spokes might " be formed like the C spring, or the volute, being fixed at " one end to the nave, and at the other to the interior of the " tire. The tire might also be composed by continuing the " spring spokes in length, and bending the super-requisite " lengths into a circular form, and then encircling the whole " with an outer tire of vulcanized india-rubber, solid or " tubular, or other elastic substance. In the case of a " locomotive for common roads, this construction of wheel " would take a greater grip of the ground, and thus over- " come that tendency to slip which has hitherto proved the " great obstacle to locomotive progress on common roads, " where the gradients vary considerably."

[*Printed, 4d. No Drawings.*]

A.D. 1852, October 21.—No. 480.

FOWLER, JOHN.—" Machinery for draining land."

The invention relates to machinery for forming drains in land by steam power and consists in so arranging the parts that " the boiler, steam-engine, and coulter or cutter are all " combined and go together, the steam-engine giving motion " to a drum to wind on a wire rope, and thus to move itself " up to an anchor or fixed point on the land." The machine is furnished with an upright coulter and a shoe or share for forming the drain and drawing a continuous series of drain tiles into it, like the apparatus described in Nos. 12,989, A.D. 1850, and 13,285, A.D. 1850. A steam-engine and boiler are fixed upon the carriage, which travels on four broad wheels, and carries at its front end a large drum. On the crank shaft driven from the steam cylinder are four eccentrics, and these, by suitable connecting rods acting on a ratchet wheel on the drum shaft, impart a "step-by-step" motion thereto. The end of a wire rope is conducted from the drum to the opposite side of the field, passed round a pulley attached to an anchor or holdfast, and then brought back and fastened to the frame of the carriage; so that on the drum being put in motion by the engine, it winds up the rope, and draws the machine towards the anchor. If greater speed be required, the pulley is dispensed with, and the end of the rope is secured to the anchor. When the machine has arrived at the anchor, the power of the engine is applied to turn a small drum, round which is passed a rope from an anchor situated at the place where the machine is to recommence its action; and as the carriage is thus drawn back to the opposite side of the field, the large drum pays out or delivers its rope in readiness for the next forward movement of the machine. The patentee states that for some purposes he prefers to perform the operation of delivering or paying out the rope from the large drum by turning the front wheels by any convenient gearing worked by the engine, so that the bite of such wheels upon the land shall act to drive the machine in the requisite direction. This arrangement also serves for the transport of the machine from place to place along common roads.

[*Printed*, 1*s*. *Drawings*.]

A.D. 1852, November 16.—No. 764.

CHRIPPES, Thomas, the younger.—(*Provisional protection only*.)—" Means of tilling land."

One part of the invention consists in "constructing or " placing a steam or power engine upon a frame mounted " upon wheels or rollers, which should be of larger area than " the engine, to enable it to travel with facility over ploughed " fields, etc. Within this frame there is a drum for coiling up " the wire rope or connector of the plough, harrow, etc., and

" such drum may be situate at such a height as shall enable " the rope to clear banks, hedges, or obstructions."

" For sowing, or for manuring with dry manures," the inventor says, " I attach to the frame of the engine a wire " frame or sieve, working on guides, and attached at one end " to the engine or its frame, and at the other to moveable " legs or supports, the sieve being moved by the engine, and " thus caused to scatter the seed or manure."

[*Printed, 4d. No Drawings.*]

A.D. 1852, December 9.—No. 1009

ALLCHIN, William. — " Agricultural and other steam " engines."

The boiler is of the ordinary tubular form with a rectangular fire-box. The smoke box has an annular space round its interior to receive and heat the feed water. The barrel of the boiler is surrounded by an " exhaust steam jacket, or annular " casing," to screen the heated surfaces from the atmosphere. This casing is kept full of steam by a pipe " from the exhaust " passages of the engine, or direct from the exhaust chamber." The bulk of the exhaust steam passes off to the chimney by the casing, to aid the draught. " The cylinders and valves " are wholly covered in by the casing," " and as the waste " steam is exhausted into the interior of the casing " " all the " parts requiring to be kept hot are thus well enveloped in " the heated vapour."

[*Printed, 6d. Drawing.*]

1853.

A.D. 1853, January 8.—No. 53.

LOVELY, Robert. — (*Provisional protection only.*) — Steam propulsion on common roads.

The driving wheel, together with the cylinders, &c., is set in a frame mounted below the body of the engine, the wheel taking a position between the two hind bearing wheels. The valve gear, &c. is mounted on the body of the engine, The frame is arranged to be lifted, so as to raise the driving wheel from the ground, by means of a steam cylinder. Another steam cylinder is used to work the fore carriage for the purpose of steering. "The cooling of the steam is " effected before passing from the cylinders to the chimney " by passing through a cavity" in a "space," the plates forming such "space being of perforated metal." "Another " novelty" "is the adaptation of a spring as the blade of " the break."

A carriage intended to be drawn by the engine is also described.

[*Printed*, 8*d*. *Drawing*.]

A.D. 1853, April 13.—No. 886.

CLAYTON, Nathaniel, and SHUTTLEWORTH, Joseph.— " Portable and locomotive steam engines."

The cylinders are placed in a steam chamber within the smoke box.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1853, May 10.—No. 1151.

JOHNSON, John Henry.—(*A communication.*)—Agricultural machinery.

A steam engine mounted on a cart is caused to drive various agricultural implements, any one of which may be mounted at the back of the cart. The cart may be drawn by horses or motion may be imparted to the wheels from the engine by means of a belt. One or two steam cylinders may be employed, fixed to the side of a vertical tubular boiler mounted at the front of the cart. The steam chest is on the top of the cylinder, and steam passes direct through a port in the cylinder cover. The cylinder is lubricated from an oil cup on the top of the steam chest which supplies oil through the port above mentioned. The connecting rod is attached to a stud on a pulley, which by any suitable gearing drives a tubular shaft on the axle of the principal bearing wheels. From this tubular shaft motion is communicated to the implement by an arrangement of shafts with bevel pinions and spur gearing. One of these shafts runs in a bearing fitted loose on the running wheels axle, so that the whole system can rock on the said axle. The slide valves are worked by a bell-crank lever connecting rod and eccentric.

[*Printed*, 1*s*. 2*d*. *Drawings*.]

A.D. 1853, May 19.—No. 1240.

HIPPISLEY, John.—" Steam engines, suitable for agricul-" tural purposes and to locomotion on common roads."

The cylinder is mounted on the top of the boiler, and drives a fly-wheel shaft on the ends of which are pulleys. Bands from these drive pulleys on axes below the boiler and these by spur gearing drive a pair of bearing wheels supporting the front of the engine. The driving band is " of a length such " that, except when it is tightened by a lever and pulley, the " motion of the fly-wheel pulley is not communicated to the " pinion wheel and its pulley, and thus as the arrangement " of cog-wheels, pulleys, lever and band is the same on both " sides of the machine, either or both of the driving wheels " can be connected or disconnected at pleasure," and the engine steered. The other end of the frame is mounted on a pair of wheels pivoted to the frame so as to act as trailing wheels. They can also act as steering wheels when the engine is being moved backwards, by means of a toothed segment and pinion.

[*Printed*, 6*d*. *Drawing*.]

A.D. 1853, May 20.—No. 1253.

BENTALL, Edward Hammond.—" Measuring and indicating " the power exerted by engines, and also the force required " to propel machinery, carriages, and ploughs."

A dynamometer for this purpose is described. Motion is given from the engine to a pulley loose on a shaft; on the boss of this pulley is fixed a bevel wheel gearing with a second bevel wheel carried by an arm on a sleeve loose on the same shaft. The arm and wheel are prevented from revolving about the shaft by a spring attached thereto, so that the bevel wheel is caused to revolve and thereby impart motion to a third wheel fixed on the shaft. A worm on the shaft actuates a counter, and also by means of suitable bevel and spur gearing turns a screw on which works a nut carrying a pencil. This pencil travels over a cylinder. Motion is given to the cylinder from a friction pulley running against a disc wheel on the screw spindle before mentioned. This disc wheel slides without turning on its spindle. The friction wheel is caused to travel along its spindle by means of a lever arrangement worked from the sleeve on the first-mentioned shaft. As it travels along its spindle it is brought nearer to or further from the centre of the disc wheel and receives slower or more rapid revolution therefrom. The speed of its revolution is therefore a measure of the angular movement of the arm on the sleeve.

The instrument may be interposed between a plough and the engine drawing it, in which case the train of bevel pulleys is not required. The instrument is mounted upon wheels, and the frame thereof is connected to the engine, the plough being attached to a rod passing through the centre of the coiled spring and compressing the same. The other arrangements are similar to those above described.

[*Printed*, 11*d*. *Drawings*.]

A.D. 1853, November 29.—No. 2775.

KELLY, Patrick.—"Apparatus for cultivating, preparing "and treating land."

The invention "consists in the combination with a loco-"motive of an apparatus or implement for opening the "land in furrows, a drill or apparatus for sowing seed, and "a roller for rolling in the seed." An ordinary locomotive engine is mounted a frame, in the hinder part of which is mounted "an iron cylinder set round with teeth "or spikes, which by means of suitable toothed gear may be "made to revolve at a considerably greater speed than the "driving wheels of the locomotive, and produce a correspond-"ing effect upon the ground." The boiler is of the locomotive class, and the cylinders are disposed horizontally, one at each side. These give motion to a transverse crank shaft carrying two toothed pinions which engage with a spur wheel fixed on the main axle, thereby giving motion through clutches to the two driving wheels and by means of other gearing and a countershaft to the implement above described.

The front wheels of the carriage may be guided either by means of a lever handle in connection with a wheel and pinion, or else by a screw. The main wheels of the locomotive are made to turn loosely on their axle when required for turning the carriage.

[*Printed*, 10*d*. *Drawings*.]

1854.

A.D. 1854, January 7.—No. 41.

JOHNSON, John Henry. — (*A communication.*) — (*Letters Patent void for want of Final Specification.*)—Agricultural machinery.

Improvements on No. 1151, A.D. 1853.—The invention relates to a steam engine for effecting agricultural operations which is to be mounted on a cart. The boiler is tubular. To prevent priming a vertical pipe leads "from the steam " and safety valve down to below the level of the surface of " the water." The pipe is open below and closed above; its upper part is perforated, so that the steam may pass through the perforations while the water falls back. There is also a perforated plate "across the lower portion of the " steam dome." The grate bars are formed into a frame, which "turns on swivil centres." The engine is a rotary one; it has "a cylinder cast with a partition in it to divide " it longitudinally into two chambers." In each of the two cylinders thus formed is a piston sliding without turning on a central shaft. "Each piston consists of a circular boss with " a rectangular projection radiating from one side." Conical projections on the cover and partition fit conical recesses on the boss, tight fitting being secured by means of a spring. The piston is packed with spring packing pieces. The engine is fitted with suitable valves. Motion is communicated from the shaft above mentioned by bevel gear, cranks, &c., to a reaper, digger, &c., mounted on the cart.

[*Printed*, 3*d*. *No Drawings*.]

A.D. 1854, July 6.—No. 1487.

JOHNSON, JOHN HENRY.—(*A communication.*)—(*Provisional protection only.*) — " Apparatus for effecting agricultural " operations."

The invention relates to a steam digger. Digging knives are mounted on a cylinder rotated by an engine mounted on the frame. The crank shafts are vertical and by means of bevel gear drive bevel wheels on the ends of the digger cylinder, and fitted within its ends so as to be protected from dirt. The shafts are also geared to a horizontal cross shaft carrying friction pulleys which can be brought into contact with the rims of the bearing wheels, so as to drive the same. By means of " a clutch and double bevil pinion arrangement " motion in either direction can be given to the friction wheels.

A vertical tubular boiler is described for use with the above and for other purposes. The tubes are arranged to form a cone, the smaller end uppermost. They open into a water space below and into a steam space above. They may be set in one or more rings. The whole is enclosed within a conical shell which "forms the water space for the water feed." Waste steam " may be blown down into heating sections " disposed inside the feed water shell."

[*Printed, 3d. No Drawings.*]

A.D. 1854, October 13.—No. 2189.

ANDERSON, SIR JAMES CALEB.—" Locomotive engines."

From the drawing and description it would appear that the engines described are intended for common roads. A double boiler is used, that is to say a boiler having two sets of horizontal tubes which lead from a central flue to flues at each side. "The water is to be pumped into the fire box," and from this it can be pumped into the boiler proper. A section of a vertical boiler having apparently a water space surrounding the central tubes is shewn in one of the drawings. The connecting rods are connected at each side "to a crank, fixed on " one end of the hind axletree, to which another crank at right " angles is fixed on the opposite side. The hind wheels " revolve on the axletree, and the axletree also turns in the " plummer blocks on which the hind springs rest. From

" each crank a carrier extends to the fellows of the hind " wheels, which can be fixed to them at pleasure.. One hind " wheel of the carriage is only to be worked at the same time " by the engines; the other hind wheel is left free to revolve " on the axle, in order that the carriage may run round " curves." An air surface condenser is used. A fan may be used to force the air into the condenser. Steam which is not condensed "is to be heated either by the boiler fire, or by " another fire or fires to be used for that purpose," in order to render it transparent. In one of the drawings a six-wheel carriage is shewn. In this case the weight of the hinder part of the carriage, &c., is borne on two large running wheels, and two smaller wheels on an axle immediately below the axle of the bearing wheels are used as driving wheels. The object of this is "not to place more weight on the driving wheels " than what is necessary to give the requisite adhesion, as a " greater weight on the propelling wheels is a loss of power."

[*Printed*, 1*s*. 9*d*. *Drawings*.]

A.D. 1854, October 30.—No. 2302.

MAGGS, OLIVER.—"Portable steam engines."

1. Water spaces or chambers are formed in the fire-box. They are connected to the top of the fire-box by a flange, and to the inner casing by short tubes. The top of the fire-box is strengthened by "hollow trusses," connected either to the inside or to the outside of the fire-box. The boiler itself is formed with two sets of horizontal flues, connected by a chamber at the back and terminating in a smoke box at the fire box end of the boiler. Over this smoke box is a second smoke box, connected to the first by a set of short pipes. In this the feed pump and cylinder are placed, the valves of the pump being outside the smoke box. If the water spaces in the fire box are not used, the second smoke box is placed "over the " centre of the crown of the fire box." Several figures are given illustrating various sectional shapes for flues.

2. The slide valves are worked by a lever pivoted to a stud on the top of the cylinder. The other end of the lever passes through a slot in the end of the excentric rod and is adjustable therein by a pin. By this means the amount of movement of the slide valve can be regulated.

3. A second fly wheel is used, there being one on each end of the shaft.

4. The cylinder may also be secured on the top of the boiler, " embedding the lower diameter of the cylinder" "in the " upper part of the boiler at the fire-box end thereof," the chimney being set at the other end.

[*Printed,* 2*s*. *Drawings.*]

A.D. 1854, December 4.—No. 2550.

BENTALL, Edward Hammond. — "Locomotive steam engine."

The engine has only one pair of bearing wheels and is supported when in use by a prop or props in front. The axle of the bearing wheels is fitted in sliding bearings and can be traversed along by a screw. Thus it can be brought forward to take the weight of the engine or set back when the engine is at work. Friction pieces bear against the wheels when these are in their most backward position. The prop is fitted to work up and down in a bracket. It has a foot plate which rests on the ground and a pointed pin to hold it steady. It can be raised and lowered by a screw, or may be secured by set screws. The working parts are below the boiler and shut in by "hinged plates." The fly wheel is low down at one side. This arrangement serves to reduce the vibration.

[*Printed,* 10*d*. *Drawing.*]

A.D. 1854, December 30.—No. 2762.

JOHNSON, John Henry.—(*A communication from Jacques Eugene Armengaud.*)—" Obtaining motive power."

A locomotive engine for common roads is described. The steam acts directly only on one side of the piston, at the other side of the piston the cylinder is in communication with a reservoir " filled with any dense fluid or with mercury." The steam is admitted over the surface of this fluid, and its force is transmitted through it to the piston. By this arrangement it is stated the steam "exerts an amount of " pressure against the end of the cylinder and against the " piston, which would be capable of moving the whole ma- " chine even though the piston were not in communica- " tion with the crank axle." It is added, "the tendency

" to motion possessed by this engine renders it highly " suitable for the ascent of steep inclines." The hinder bearing wheels are driven direct by the piston rod, with a connecting rod of the usual sort, and the front wheels are mounted in a frame on which the end of the engine can be raised and lowered by a screw.

[*Printed*, 10*d*. *Drawing*.]

1855.

A.D. 1855, January 6.—No. 35.

JOHNSON, John Henry.—(*A communication.*)—Agricultural machinery.

Improvements on No. 1151, A.D. 1853.—Two modifications of a steam digger are described. A digger cylinder mounted at the back of the frame receives motion from a pair of steam cylinders on the frame. The crank shafts, which are vertical or inclined, have on them pinions gearing with bevel wheels fast on the digging cylinder and within its open ends. Motion may be imparted to the bearing wheels by friction pulleys working against their peripheries. The digger cylinder can be put out of gear by a clutch, and the friction pulleys can be put out of gear with the wheels by means of a quick-acting screw or otherwise. Instead of using friction rollers to drive the bearing wheels, in the second modification " two rollers " " are employed having a number of studs, " pins or teeth on their peripheries which take into corre- " sponding holes or recesses formed in the peripheries of the " main supporting wheels."

The boiler is a vertical tubular one. It is formed with a conical shell forming " the water space for the boiler feed." The bottom is formed by a " narrow water space inclined or " angled to suit the flue tubes." The tubes are arranged to form a cone; they open into a steam space at top. The fire bars are above the bottom water space, and the products of combustion pass up into the conical space surrounded by the tubes. The tubes are " enclosed by an outer shell set within " the water space shell." Waste steam may be blown down into "heating sections disposed inside this feed water shell," and the exhaust steam passes through steam spaces formed in the shell.

A.D. 1855, ... No. 35*.

ROMAINE, Robert. — Memorandum of alteration to the Specification No. 35, A.D. 1855, filed July 9, 1856.

The Specification contains the description of two arrangements of machinery for digging or tilling land. In the explanation of the second machine the following sentence occurs:—

"In place of using frictional rollers or pulleys for that " purpose two rollers L are employed, having a number of " studs, pins, or teeth on their peripheries which take into " corresponding holes or recesses formed in the peripheries " of the main supporting wheels."

In the memorandum of alteration this sentence is altered so as to read thus:—"In place of using frictional rollers or " pulleys for that purpose, two pinions L are employed, " having studs or teeth on their peripheries, which work into " corresponding holes or teeth formed in the peripheries of " the main supporting wheels."

[*Specification printed*, 1s. 1*d*. *Drawings.*]
[*Disclaimer*, 5*d*. *Drawing.*]

A.D. 1855, June 12.—No. 1343.

FORD, Henry William.—"Apparatus for effecting agri" cultural operations."

A "self-locomotive agricultural engine" is described. It has digging apparatus behind, and can be used for hauling various implements. The main driving wheels are driven from the crank shaft of the engine by bands and pulleys, the respective sizes of the pulleys being arranged to give a slow motion. The leading wheels "have their axle expanded into " a ring" "so as to enable it to encircle the lower end of the " fire-box." The wheels are moved for steering by a segmental rack and pinion. These wheels can also be driven from the driving wheels by an arrangement of belts which allows the wheels to be moved for steering. The belts of the driving wheels have tension pulleys by which they can be slackened or tightened. When the digging apparatus is at work, the straps are slackened, and an intermittent motion is given to the driving wheels by a ratchet and pall worked by an excentric on the engine shaft. The driving wheels have metal friction straps on them which act as breaks. These are tightened by levers on their ends operated by a hand wheel.

[*Printed*, 2*s*. 10*d*. *Drawings*.]

A.D. 1855, July 6.—No. 1517.

BALK, William.—(*Provisional protection only*.)—"Construc-" tion and combination of parts of portable steam engines."

The boiler is cylindrical, with a cylindrical fire-box at the end, from which several tubular flues are carried to the smoke box at the other end of the boiler, and from this other tubes open into a smoke-box at the firing end of the boiler. Above these return tubular flues a portion is formed in the back smoke-box with an opening and a slide by which when lighting the fire the draft may be sent direct to the chimney without returning to the front. Other flues lead back from the front smoke box to the upper part of the hinder smoke box, above the partition. The draught is aided by a blast. The steam engine is fixed on the upper part of the boiler, and the cylinder is in one casting with the frame; the plummer blocks for the bearings of the crank shaft, and the steam ways being formed in casting the same. The piston rods extend beyond the crosshead, and slides through a bearing on the boiler.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1855, August 9.—No. 1807.

ADAMS, William Bridges.—(*Provisional protection only*.)—" Locomotive engines."

The invention is applicable to common road locomotives. The driving wheels are raised and their rims rest on the rims of loose running wheels which rest on the ground. Each driving wheel is supported by two such wheels, which may be coupled or not. The peripheries may be coned or cylindrical.

The driving wheel on one side may be lifted out of contact with the supporting wheels; or the driving wheels may be disconnected "by means of a divided axle," "so as to work by

" one side only and allow the rollers to adjust their speed to " curved lines of way or road." A ring of india-rubber may be fitted between the tyres and the peripheries of the wheels, so as to allow a certain amount of elasticity; and "the " driving wheel tyres may be an easy fit on the bodies of the " wheels, so as to move slightly round them on pressure " being applied."

The boiler may be below the axles, and the bottom of the fire-box may be either level with the bottom of the boiler or in the usual position with regard to it.

[*Printed*, 3*d*. *No Drawings*.]

A.D. 1855, November 28.—No. 2686.

LEE, Joseph.—(*Provisional protection only.*)—" Agricultural " or farmers' engines, which improvements are applicable " also to locomotive engines."

This invention relates to an " arrangement of the boilers, fire- " boxes, and ash pans of agricultural and locomotive engines, " with oblong fire-boxes, whereby a greater heating surface is " obtained, and the risk of fire by the escape of burning fuel " from the grate is avoided. The improvement consists in " making the fire-box and ash pan in one piece, and continuing " the boiler plates underneath the ash pan, so as to leave one " continuous water space round the sides of the fire-box and " underneath the ash pan. A suitable opening is formed in " the back or front of the ash pan to admit air to the fire, and " to facilitate the removal of the ashes from the ash pan." " The ash pan is fitted with a door, made so as to rise or fall " at pleasure for the purpose of regulating the draught."

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1855, December 21.—No. 2887.

KYLE, David Dunne.—" Method of communicating mo- " tion."

This invention consists in " placing a portion of the weight " of the engine or load on the periphery, or other concentric " parts of the propelling wheels, instead of on their axles, by " this means pressing downwards those parts of the wheels, " and causing them to move forward and revolve." The engine is set on a carriage constructed with two hind wheels and two leading wheels: the axle of the latter is moveable on a swivel on the end of the pole of the carriage, and bent spur wheels are fixed on the insides of the leading wheels. The engine rests at one end on the carriage, at the other end the spur wheels gear with those fixed on the leading wheels. and the loose wheels on the outer end of the axles of the spur wheels rest or travel on the tyres of the leading wheels. The end of the engine which rests on the carriage is supported on pivots, so as to allow of a vertical motion to the spur wheels and parts in connection with them. These pivots rest on a strong frame supported on rollers which traverse a segmental rail fixed on the carriage, and having the swivel pin for its centre; to this rail a rack is attached, in which a small tooth wheel carried by the engine works to change the direction of the carriage. When the shaft is in motion, the spur wheels drive the leading wheels, and the leading wheels act as endless rails along which the spur wheels travel. Radial scrapers are attached in front of the leading wheels to remove stones in advance of them, fixed scrapers and ploughs may also be used, and the wheels are disengaged by a self-acting clutch. The patentee says, the invention "is one applicable to the agri-" cultural use of my machine for excavating and removing " earth."

[*Printed*, 10*d*. *Drawings*.]

1856.

A.D. 1856, January 4.—No. 31.

HART, Charles. — (*Letters Patent void for want of Final Specification.*)—Portable engines and agricultural machinery.

The first part of the invention relates to the construction of portable or locomotive steam engines, adapted more particularly for agricultural purposes. The boiler is mounted upon a pair of travelling and driving wheels, with a guide wheel in front. A cylinder is placed on the boiler, and a connecting rod from the piston gives motion to a crank shaft having at one end a fly wheel, at the other end a bevel wheel working in a second bevel wheel on the top of a vertical shaft; a worm takes into another worm on a second horizontal shaft, having a pinion at each end. The inner edge of the tyre of the a crown wheel, and the two pinions are so placed within the toothed edge as to work into the latter, and cause the wheels to revolve and propel the engine along the ground. To facilitate travelling upon soft land a circular endless rail is used. This is "wider and larger in diameter than the rim of the " travelling wheels, fitted with suitable guides for keeping it " in its proper position around the travelling wheels."

The second part of the invention consists in furnishing the portable locomotive engine with apparatus for tilling or cultivating land. For this purpose at the hinder part of the machine, near to the surface of the ground, is placed an adjustable horizontal shaft, armed with a number of tines or cultivators. As the engine travels over the land, a rotary motion is imparted to the shaft by a worm and worm wheel, and the tines or cultivators are thereby caused to enter and break up the soil.

[*Printed, 4d. No Drawings.*]

A.D. 1856, January 16.—No. 120.

FOWLER, John, junior.—" Machinery for ploughing land."

This invention comprises a steam engine, horizontally disposed upon a suitable carriage mounted on wheels, the fore wheels having a locking motion with toothed segment and pinion and a suitable steering apparatus. The crank shaft carries a fly-wheel, and by the aid of gearing gives motion to a drum, which by means of a warping rope is used for moving the machine from place to place. Beneath the machine on a vertical axis actuated by bevel gearing, is a winding-on drum; which by means of a wire rope draws the subsoil plough or implement which is used when cutting drains across the land. The engine carriage is moved from point to point along the headland, and the pull upon the rope and implement is direct. The boiler is mounted upon wheels by itself, and attends upon the engine carriage, the steam being supplied thereto by means of a flexible pipe.

For the purpose of resisting the pull of the rope when working with subsoil and other ploughs a plate or frame placed upright in a hole is employed. To this plate is hinged a lever, to which, at its upper end, is fixed a rope; the lower end of the lever is widened, and when the rope is pulled it rests against the sides of the hole as to form an anchorage for the engine and machinery.

[*Printed*, 1s. 4*d*. *Drawings*.]

A.D. 1856, February 9.—No. 345.

DUNCAN, John Wallace.—" Generation and application of " steam."

Among the numerous matters included in this invention is a raft, for travelling over land or ice, as well as through the water. To the underside of this raft are fitted hollow cylinders with helical blades on them. These cylinders are rotated by an engine on the raft, and the screws serve to propel the raft in the water or on the land. The inventor after describing the raft says:—" Another improvement under the head of " my invention consists in constructing a machine on the " principle of the raft last herein-before described, having cylin- " ders with spirals or screws thereon; in the application of " steam to cultivation for the purpose of carrying or drag- " ging implements or other things necessary over or through " the land."

[*Printed*, 3*s*. *Drawings*.]

A.D. 1856, May 20.—No. 1186.

FOWLER, William, and McCOLLIN, William.—(*Provisional protection only*.)—" Portable steam engines applicable to " agricultural and other similar purposes."

The invention " consists in attaching to a portable boiler a " frame or saddle, on one end of which are fixed suitable " bearings for carrying the trunnions of an oscillating cylin- " der. On the other end of the frame or saddle are situated " the bearings of the fly-wheel shaft, upon which and between " the hind bearings is a double crank, to which is connected " the piston rod appertaining to the before-named oscillating " cylinder. The feed pump for the boiler is also fixed to the " aforesaid frame or saddle, and is driven direct by an eccen- " tric on the fly-wheel shaft. The slide valve is geared in the " ordinary manner."

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1856, June 25.—No. 1495.

CHANDLER, Robert Wilson, and OLIVER, Thomas.—"Engines employed for agricultural purposes."

The winding drums are mounted on the axles of the bearing wheels; they are driven by an inclined shaft and bevel gearing from an overhead crank shaft acting on a spur wheel fixed on each drum.

Sometimes the bearing wheels have flanges fixed on them and are used as winding drums, the end of the engine being raised from the ground on tressels.

[*Printed*, 10*d*. *Drawing*.]

A.D. 1856, July 1.—No. 1540.

LONGRIDGE, James Atkinson.—"Application of mechanical power to ploughing and other field operations of agriculture."

The invention relates to the use of a screw for propelling tilling implements. The screw is mounted on a carriage on which is a steam engine or other prime mover, or on a separate frame connected thereto. From this rotation is given to the screw and by this means the carriage is propelled. The tilling implements may be attached to the screw frame, or may be on separate carriages, hauled by the principal carriage. The screw is composed of several turns. Its bearings have springs on them so that it can yield to any obstacle. The steam carriage is mounted on broad wheels, and if the screw is on a separate frame, this carriage may be moved by having its wheels driven by the engine.

A stationary steam engine may be employed to compress air which afterwards is used in a portable air engine which drives the screw, the air engine being either fitted with reservoirs or supplied by a flexible pipe.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1856, July 10.—No. 1635.

FOWLER, John, junior, and WORBY, William. — "Machinery for ploughing and tilling land by steam."

"Two drums or capstans with upright or vertical axes "are, with the steam engine which gives motion to them,

" mounted in a suitable frame on wheels, in order that the " carriage may be moved progressively on the land, in " place of having the capstans and steam engine anchored " or fixed to the land." The capstans are worked by the engine in such manner that they may alternately wind up their ropes, so that whilst one is being driven by the engine the other is running free, and unwinding its rope. In place of the two drums on the same carriage with the engine, two carriages may be used, " each with one " upright barrel or capstan and an engine," and the wire rope is wound alternately by the drums. It is stated that the engine and boiler are of the ordinary description, giving by means of clutches conjoint or separate motion to the winding drums. An improved anchor is described, as are also certain improvements in the tilling implements.

[*Printed*, 2*s*. 6*d*. *Drawings*.]

A.D. 1856, July 12.—No. 1648.

POPE, John.—(*Letters Patent void for want of Final Specification.*)—" Application of steam power to ploughing and other " agricultural purposes."

The invention " consists in the application of a light " locomotive engine, mounted on broad wheels or rollers, " having transverse ribs projecting on the periphery or other " suitable projections, to hold the ground & afford sufficient " bite for traction, the breadth of the wheel or roller at the " same time prevents any prejudicial sinking in the ground." Ploughs are attached to the engine by " suitable traction bars " or chains." " Each plough has a man in the handles to " guide & control it in the usual manner. Other implements " may be attached to this engine & dragged over the ground " in the same manner."

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1856, August 18.—No. 1926.

CAMBRIDGE, William Colborne.—(*Provisional protection only.*)—" Portable railways."

The railways are to be applied to the bearing wheels of portable engines, agricultural implements, &c. They are composed of " broad plates or sheets of iron " with a central rail, so arranged that the different sections when in position form a continuous rail on which the wheels of the engine &c., travel. The sections "are connected to centres by means " of arms, which as the carriage advances lay down the " sections successively in front of the wheels and take them " up again when the wheels have passed over." The plates have flanges on them to prevent the earth clogging them.

[*Printed, 4d. No Drawings.*]

A.D. 1856, September 11.—No. 2121.

ROBINSON, JOHN BLYTHE.—(*A communication.*)—" Machinery " for effecting agricultural operations."

Improvements on No. 1151, A.D. 1853, and No. 35, A.D. 1855.

The invention relates to a steam digger. A locomotive boiler is used. The crank shaft of the engine (which may be arranged on the frame in various positions) passes through the tubular axles of the two main bearing wheels. These wheels are formed with grooves in their peripheries, having teeth formed therein, to gear with pinions by which they receive motion from the crank shaft. Studs or spikes may be fitted to these wheels to increase their grip. Either wheel may be put out of gear to assist in steering. The front wheels may be castor wheels, or they may be fitted to brackets carried by worm wheels which engage with worms, so that they can be worked together or independently for steering. The " king " bolt " of the fore carriage is screwed, and has a nut thereon, by means of which the front of the frame can be raised or lowered to preserve the proper level of the water in the boiler. A " compensating beam or lever " pivoted centrally on the boiler shell may be connected by links to the upper ends of the forked standards carrying the front wheels when such are employed. The object of this is to cause the wheels " to bear equally on uneven surfaces."

[*Printed, 1s. 11d. Drawings.*]

A.D. 1856, October 30.—No. 2552.

HOLCROFT, HENRY.—" Steam engine specially applicable to " agricultural operations."

The engine is stated to be specially adapted for the tillage of land, but "by the addition of pulleys it may be employed for " driving machinery, for manufacturing drainage pipes, for " thrashing grain, and other agricultural purposes." The engine derives its motion from a traction screw or propeller, placed in front, at a right angle to the axis of the boiler. This is composed of a cylinder having two or more threads upon it, and is fixed to the axis on the lower part of a vertical telescopic tube which slides up and down, and has also a motion round its axis in an outer case or cylinder fixed on the boiler; at the top of the telescopic cylinder is a steam cylinder and piston, on the rod of which is a crank that actuates the traction screw, and on a plate fixed to the telescopic cylinder is a vertical steam cylinder with steam chest and valve; above this is a hydraulic cylinder by the action of which the screw is raised and lowered; in each cylinder is a piston, and the two are connected by one rod or crosshead. The telescopic cylinder receives its circular motion to alter the direction of the traction screw by a segmental rack. The boiler is placed longitudinally on a frame supported on wheels, it is composed of three or more cylinders placed in the smoke box, that the heat and smoke from the fire-box may heat the feed water in a reservoir over a boiler before passing up the chimney. The traction screw also may be raised and lowered by pulleys, over which is passed a chain attached to the telescopic cylinder.

[*Printed*, 1*s*. 2*d*. *Drawings*.]

A.D. 1856, December 11.—No. 2947.

CAMBRIDGE, William Colborne.—" Portable railway."

The invention consists in fitting round the wheels of traction engines, &c. a sort of endless chain of flat plates connected by links. The plates are each fitted with a central rail, on which the wheel travels, and have flanges which hold them to the periphery of the wheel. The connecting links are pin-jointed to the plates at a point midway from their ends, so that each plate works freely as on a pivot, being only supported at that point. The "railway" can be removed by taking out the pin connecting any one of the plates to the links.

[*Printed*, 6*d*. *Drawings*.]

A.D. 1856, December 31.—No. 3102.

BRAY, William.—"Traction engines."

The improvements consist in fitting the wheel with blades, teeth or spikes, that are projected and retarded as required, to give the engine hold in soft ground. The tires of the wheels are very broad, and the blades pass in and out through slots therein. These blades are joined by connecting rods to a ring surrounding an eccentric on the axle of the wheel. The wheel is driven by a pinion gearing with an internal spur wheel thereon. Broad flanges are fixed to the tire to prevent the earth clogging the wheel. The blades are cleared by being drawn through the slots in the rim. The position of the eccentric may be shifted, so that when necessary the blades may be made to protrude at the top of the wheel, and thus be thrown out of work when the engine is on a road. A cam or crank may be substituted for the eccentric, and the eccentricity of the throw may be varied. The parts may be so constructed that when the eccentric is brought concentric with the axle, the blades are not protruded, and the wheel may then be used as a driving pulley for a belt to convey motion to a thrashing machine, &c. It is, however, preferred to use a separate pulley on the engine shaft for this purpose, the pinions which drive the bearing wheels being made to slide with a feather on their shafts. The blades on the bearing wheels then serve to anchor the engines. By means of the sliding pinions also one wheel can be thrown out of gear in turning the engine. The engine is supported on two bearing wheels and a steering wheel, or it may be pivoted to a frame mounted on a pair of steering wheels.

[*Printed*, 10*d*. *Drawings*.]

1857.

A.D. 1857, January 30.—No. 285.

WILLIAMS, John Allin.—"Machinery or apparatus for "ploughing or tilling land by steam power."

An "ordinary agricultural engine" has connected to it behind a wheeled frame on which a winding drum is mounted.

This frame can be disconnected from the engine, but when at work it is, by means of beams and tie rods, "rigidly secured "and braced to the engine, so as to form, in fact, one com-"pound machine." The winding drum is mounted on an axis set longitudinally upon the frame; it is rotated by bevel gearing from a cross shaft driven by a chain wheel from a pulley on the engine shaft. There is a clutch for throwing the drum into and out of gear with the engine. A pair of adjustable guide pulleys mounted on a frame at the side lead the traction rope to the drum, and a coiling lever operated by hand by the attendant lays the rope on evenly. A small winding drum under the frame of the large winding drum can be operated by a chain wheel on the engine shaft, to wind the whole apparatus up to a fixed anchor. By a similar arrangement, the bearing wheels of the engine can be driven. The chains used can be varied in length to suit these different purposes, by adding or removing links, some of the cross pins of the chains being moveable. For travelling along a road, the frame carrying the winding drum is not rigidly attached so the engine, but so that it has a certain amount of play to allow of its turning round curves. The engine is guided by a horse attached in front. Wooden felloes are fitted over the rims of the bearing wheels with layers of felt or india-rubber under them.

Two engines are used in ploughing, one at each headland. The return rope is in certain cases taken back by a horse, and a weighted break is then fitted to the drum to regulate the paying out of the rope.

[*Printed*, 2*s*. 2*d*. *Drawings*.]

A.D. 1857, February 12.—No. 414.

BLACKBURN, Isaac, and BLACKBURN, Robert.—"Engines or implements to be employed in agriculture."

The invention relates to the construction of locomotive steam engines to be employed for hauling agricultural implements, for carriages on railways and common roads, as traction engines and as steam rollers. It consists of a cylinder or drum of considerable diameter, inside which, suspended from the axis, the boiler, cylinders, &c., are fitted, so as to maintain a horizontal position, whilst the cylinder revolves around them being driven from the engine shaft, whereon is fixed a spur pinion which engages with annular gearing internally fixed round the drum. By this means the drum is caused to roll over the ground and drag after it, when employed for the purpose, the ploughs and other tilling implements. Into each end of the drum is fitted a spoked wheel of corresponding size. The naves of these wheels are made hollow, to receive and support the trunnions which are attached to the boiler. To the outside ends of the trunnions are attached side frames, which are connected by a transverse frame, whereto the fore carriage, steering wheels, and necessary gear are attached; a portion of the weight inside the drum being, by means of friction rollers, transferred to annular rails fixed round the inside of the drum. The products of combustion issue through the hollow trunnions into chimneys attached to the side frame; the steam valve is operated outside by means of a spindle which passes through the trunnions, and the boiler fire is fed from a hopper by a feeding apparatus.

When constructed for travelling on rails, the drum is flanged, and the outside frames, whereon is the water tank, extend fore and aft, and are fitted to receive the axles of travelling wheels, one pair at each end of the carriage. The steam boiler is of the multitubular class, and the engine cylinders are horizontally disposed and fixed, one on each side. The pinion which rotates the drum may be thrown out of gear, and the engine used as a stationary one for thrashing, &c.

[*Printed*, 1*s*. 10*d*. *Drawings*.]

A.D. 1857, February 13.—No. 434.

ROBOTTOM, Titus.—(*Provisional protection only.*)—" Loco-" motive engines chiefly adapted for the purposes of common " road or street traction and the working of agricultural " implements."

On the top of the boiler are fixed "hollow columns and " pipes, supporting a tube or tubes, which act as a steam " chamber;" by this arrangement in ascending inclines, " the level of water in the boiler is never materially " diminished, at least not so much so as to admit of injury to " the tubes or fire box." At the back of the engine are two drums mounted separately on independent axles, and to the bottom of the boiler are secured two guide pulleys or rollers, to guide the wire rope or chain on to or off the drums. Two speeds are obtained by means of change wheels on the axle of the driving wheels. Also, the inventor employs the "mechanical appliances of two engines on one boiler and "steam chest, coupling these two engines at will or using "them independently."

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1857, February 14.—No. 438.

FULTON, Hamilton Henry, and ETTY, Thomas Bodley.—(*Provisional protection only.*)—"Generation and application of "steam power for propelling, hauling, driving, or conveying, "particularly applicable to farming purposes."

1. Constructing boilers of two cylinders connected by pipes, one cylinder containing the fire-box, and the other the tubes.

2. Fitting differential gear to the driving wheels of locomotives to vary the speed.

3. Fitting to locomotives a grooved drum which winds up an anchored rope, and "applying guide pullies for the "purpose of passing the ropes or chains from one groove to "the other when a capstan or drum having two or more "grooves is used."

[*Printed*, 3*d*. *No Drawings*.]

A.D. 1857, March 18.—No. 765.

ANDERSON, Sir James Caleb.—(*Provisional protection only.*) —"Locomotive and other carriages."

1. A horizontal cylinder is fixed at the top of a tubular boiler. This cylinder is connected to the boiler by pipes, and forms a steam chamber. By this means "the tube cylinder "and fire box of a locomotive boiler can be kept almost full "of water, which will secure the tubes and the top of the fire "box from being left uncovered with water on ascending or "descending hills."

2. A "universal railroad" is described. It is applied to engines for common roads and for ploughing, as well as to carriages. The wheels of such engines &c., run on the inner periphery of larger wheels. "The axle of each large wheel "or circular railroad is to revolve in a box fixed to a frame "placed on the outside of each large wheel." Bolts on the

engine carriage work in grooves in these frames. The large wheels also may have deep flanges, and run loose on the small wheels. The surfaces in contact may be cogged or lined with suitable material to prevent slipping. The inner wheels also may have grooves, fitting over a rail on the larger wheels. The steering wheels of the engines may be without these outer wheels.

3. To " get rid of the opaque appearance " of the exit steam it is made to pass through a considerable length of coiled pipe, and mixed with products of combustion from the fire.

4. Certain arrangements for a steam passenger carriage.

[*Printed, 4d. No Drawings.*]

A.D. 1857, April 6.—No. 960.

BURRELL, Charles.—(*Letters Patent void for want of Final Specification.*) — " Portable steam engines suitable for agri-" cultural purposes."

The improvements " have reference to applying apparatus to " such descriptions of steam engines, in order that the power " they are capable of exerting may be used in propelling their " carriages from place to place. And the improvements consist " of applying chain wheels to the shafts driven by such steam " engines and also to the running wheels of such engines, and " by means of endless chains or bands, suitable to work in gear " with chain wheels, to give motion to the running wheels of " such carriages. The chain wheels for this purpose are fixed " on the driving shafts, and are of smaller diameter than " those on the running wheels, so that the comparatively " small power of the steam engines, by being reduced in " speed in respect to the running wheels, may be able to drive " such wheels. These improvements are peculiarly appli-" cable when using what is known as a Boydell's patent " apparatus, but they are also applicable when such apparatus " is not employed and where the running wheels run directly " on roads or on the land."

[*Printed, 4d. No Drawings.*]

A.D. 1857, April 11.—No. 1022.

ROBINSON, John Blythe.—(*Letters Patent void for want of Final Specification.*)—" Apparatus for effecting agricultural " operations."

Improvements on No. 1151, A.D. 1853, No. 35, A.D. 1855, and No. 2121, A.D. 1856.

A steam engine mounted on a carriage is caused to operate various implements connected to the carriage. The cylinders are oscillating, and are placed under the boiler. Their piston rods work on to cranks on a shaft within the tubular axle of the bearing wheels. Power is communicated from the engine to the steering gear, and also for the purpose of raising the digging cylinder when one is used. The gearing for driving the cylinder is placed within it, or the said cylinder is connected direct to the first motion shaft. The spur wheels by which the bearing wheels are driven are attached to the sides of the bearing wheels. The feed water is heated by the exhaust steam, and a superheater is used. Endless railways may be fitted to the wheels, and "skids or shoes to the main " supporting wheels."

[*Printed*, 3*d*. *No Drawings*.]

A.D. 1857, May 11.—No. 1328.

HALL, Collinson, and CHARLTON, Thomas.—"Agri- " cultural engines and implements used therewith for plough- " ing and cultivating the soil."

The driving wheels of the engine have rings of spur teeth upon them, with which pinions gear, themselves driven by suitable gearing from the crank shaft. Either or both wheels may be thrown into or out of gear by clutches. For the prevention of priming caused by the boiler being thrown out of level, steam pipes are led to the steam cylinders from different ends of the boilers. Valves are fitted to these pipes, and they are worked so that steam is only taken from the end of the boiler which is highest. The valves may be worked by hand or by a weighted lever. The engine and boiler on their arrival at a "land's end," are turned by a hydraulic ram worked by steam from the boiler, the cylinder being placed under the boiler and engine carriage in such a position that the whole boiler, engine, and carriage are lifted off the ground and turned upon the cylinder as a centre. The engines are steered by a worm wheel connected to a spindle that is attached to a double eye or box, which embraces the axle for carrying the engine on the steering wheels; the eye being connected to the axle by a bolt so as to allow it to have a slight up-and-down motion. A shaft carried from the worm works a steering wheel by which the driver may guide the engine.

The rest of the Specification is occupied with a description of a method of " connecting ploughs, or frames of ploughs or other " implements for tilling the soil, both before and behind a loco- " motive engine, and providing them with the means of being " thrown into and out of work." In the plan shown in the drawing, there are two sets of implements attached to the engine at the side, one set acting in one direction, the other in the other. When nearing the headland the engine is steered out, the ploughs, &c. being still kept in the straight line, until there is a space between the engine and implements equal to the breadth of the strip of land treated by the implements at each traverse. The implements are then brought close up to the engine, and consequently on to the unbroken ground, and the backward journey is commenced. The inventors also say :—" In some cases we connect the implements " rigidly to the engine to enable us to take advantage of the " weight of the engine."

[*Printed*, 1*s*. 4*d*. *Drawings*.]

A.D. 1857, May 11.—No. 1329.

BROOMAN, Richard Archibald. — (*A communication.*) — " Locomotive apparatus for rail and ordinary roads."

The driving wheels are cogged, and the cogs engage with a circular rack fitted in a groove in the inner side of the rims of large supporting wheels. "Two other rollers working in the " groove in the upper part of each endless rail maintain the " carriage in position at top." The shaft of the driving wheels is fitted with differential spur gearing by which the speed can be varied.

[*Printed*, 3*d*. *No Drawings*.]

A.D. 1857, May 12.—No. 1343.

MASSEY, William.—" Engines for the cultivation of land " by steam power."

The boiler is of the vertical class. The engine is of the usual character and, by means of spur gearing and clutches, drives a pair of drums mounted on the frame. The rope is laid on the drum by a pulley traversed backwards and forwards across the face of the drum. The pulley works on a shaft with "double or right and left-handed grooves cut spirally " upon its surface" "which will thus cause the rope to be " laid spirally upon the drum."

The drums can be shifted, being raised by means of a screw working in a nut on the frame, and the engine can then be used for other purposes.

[*Printed*, 10*d*. *Drawing*.]

A.D. 1857, June 3.—No. 1564.

REMINGTON, George, and BALCOMBE, John Barton.— " Locomotive engines applicable to common roads."

An endless railway is fitted to the engine wheels. It is constructed of iron plates, or timber blocks jointed by iron links, leather, &c., or it may be iron wire, or entirely of iron links. The railway may be applied to the wheels on both sides, or it may be fitted to a single central set of wheels, other wheels running on the ground being also employed. When there is a railway on each side, the two may be connected by cross bars, or not. The wheels are flanged or grooved to fit the form of the railway.

[*Printed*, 3*d*. *No Drawings*.]

A.D. 1857, June 16.—No. 1682.

FOWLER, John, junior, and WORBY, William.—" Plough- " ing or tilling land."

Various improvements in steam ploughs, anchors, &c. are described.

The last part of the invention consists in combining with a locomotive engine (such as is described in No. 1635, A.D. 1856), having drums combined with it, on to and off which drums the traction rope is wound, "an additional winding drum," capable of being thrown in and out of action, "to assist in " moving the engine in places where the land is so uneven or " bad that there is difficulty in moving the engine forward " by gearing the carrying wheels." This additional drum is driven by a worm and worm wheel actuated by the engine.

[*Printed*, 1*s*. 6*d*. *Drawings*.]

A.D. 1857, June 16.—No. 1684.

FOWLER, John, junior, BURTON, Robert, and CLARKE, Thomas.—"Locomotive and other carriages."

1. Arranging the wheels so that they can be driven without interfering with the steerage. The driving wheels on each side are mounted on "short tubular axes," through which passes a solid axle. This "has a nut at each end to keep the "bevelled wheels in gear on opposite sides with two, four, or "other number of bevelled pinions which are mounted so that "they can turn freely on axes which form the spokes of a "large spur wheel mounted on the solid axis before men-"tioned; this spur wheel being driven communicates motion "to the two driving wheels, but does not prevent one of "them from turning faster or slower than the other when the "carriage is required to turn."

2. For propelling locomotives up hills a winding drum is used which winds up a rope made fast to a fixed point ahead. This drum is driven by a worm and worm wheel driven by a band with fast and loose pulleys from the main shaft.

3. In "locomotive carriages which lay for themselves a "road," the wheels are V-shaped, and run in V grooves in the moveable road.

4. "Method of causing the wheels of carriages to lay for "themselves rails." The portable "railway" is in two sections, which "are lifted and drawn forward alternately "along the land." Each wheel is "in two halves or parts "placed similarly at different distances from the centre line "of the machine, so that one of the parts of the wheel treads "on one of the sections of road and the other on the other "section." A pin on each half wheel engages with a catch on its section and draws it along as soon as it leaves it.

The Provisional Specification also describes a method of laying a "road" for the wheels. Each wheel is surrounded by a double wheel with its periphery formed of hinged plates on the inner surfaces of which it runs.

[*Printed*, 1*s*. 6*d*. *Drawings*.]

A.D. 1857, July 10.—No. 1926.

SMITH, William.—"Steam engines for giving motion to "agricultural implements."

No improvement in the engine itself is described. The invention "consists in arranging the back of the engine so "that the implement attached thereto may be guided or moved "sideways in either direction, and also so that the implement "may be raised out of the earth by means of a crane attached "to the back of the engine." For this purpose the implement is "attached by a hinge joint to a slide which slides between "guides at the back of the engine." Motion is given to this slide preferably by a screw actuated by a winch handle and bevel gearing. To raise the implement from the ground a chain is attached to the end thereof, and "the implement "being connected to the slide at the back of the engine by "a hinge joint, when the crane is turned the back of the "implement is raised."

[*Printed*, 10*d*. *Drawing*.]

A.D. 1857, July 31.—No. 2089.

INMAN, George.—"Locomotive engine."

The invention is principally intended for common road engines. The driving wheel is fitted with a number of radial rods which extend from the axle to the rim and pass through openings in the rim. These rods are alternately thrust out and retracted so as to push against the ground and thereby impart motion to the wheel. Each rod is fixed to one side of an expanding chamber, consisting of a pair of discs of india-rubber, or it may be steel, secured at their edges. As they expand the rods are thrust outwards, and retracted as they contract. The expansion is effected by admitting steam to them. A tube leads from the boss of the wheel, which is hollow, to the chamber, and the end of this tube is put in communication alternately with a steam supply pipe and an exhaust pipe. This is effected by means of a grooved annular valve which is fixed so that the rotation of the wheel brings the pipe as required into communication alternately with the exhaust and the supply. Feet may be jointed to the ends of the radial rods, and for use on marshy ground they may be of large size so as to form "what might be termed a portable "railway."

[*Printed*, 10*d*. *Drawings*.]

A.D. 1857, August 1.—No. 2093.

COLEMAN, RICHARD.—(*Provisional protection only.*)—"Im-" provements in implements for ploughing, hoeing, and " scarifying land, and in agricultural steam engines used for " the traction of such implements."

The first part of the invention consists of improvements upon No. 10,685, A.D. 1845, and relates to cultivating implements.

The invention relates, secondly, to improvements in agricultural steam engines. The engine is mounted near the middle of its length on a pair of large wheels, so as nearly to balance the weight thereon. It is also furnished with " leading " and trailing wheels." The six wheels are placed so that the leading and trailing wheels do not touch the ground at the same time; but by throwing the preponderance of the weight at either end of the engine, the heavier end will touch the ground, and the wheels thereon become the steering wheels. A small water tank is placed at each end of the machine. The preponderance of the weight of the engine may be reversed by causing the water in one tank to flow into the opposite tank.

[*Printed*, 4*d*. *No Drawings.*]

A.D. 1857, August 12.—No. 2151.

WAGSTAFF, ROBERT.—" Apparatus for digging land."

A series of steam cylinders is arranged at the back of a carriage on which is mounted a boiler and an engine by which the carriage is propelled. These cylinders work spades attached direct to their piston rods. The required motion is given to the spades by a system of joints and levers, &c. The slide valves of the cylinders are worked by eccentrics, which receive motion from the bearing wheels. They are supplied with steam from the boiler by " a suitable arrangement of " flexible and packed steam pipes and joints."

The main engine drives the bearing wheels by the intervention of frictional and spur gearing. Either or both sides can be disconnected.

The main wheels are fitted with iron or wood lags which extend beyond the rim, to allow clay, &c., to pass through. The front wheels are steering wheels.

[*Printed*, 10*d*. *Drawing.*]

A.D. 1857, August 12.—No. 2152.

WAGSTAFF, Robert.—" Locomotive engines."

The engines are available for use on common roads, for agricultural purposes, for pumping, &c. The invention consists in driving the main wheels by friction contact. Two friction wheels on the crank shaft drive other similar wheels which impart motion to the bearing wheels by toothed gearing. Means are provided for bringing the wheels on either side in and out of gear for turning, running on a curved track, &c. Friction wheels of different sizes may be used to vary the speed. The first friction wheel has " flexible " bearings," " consisting of two thicknesses of india-rubber " or other elastic substance between which is a nut in which " a screw works," so that the amount of friction can be varied. The friction wheels are provided with breaks. The feed water pumps may be used for irrigating, &c. The bearing wheels have broad " lags " of wood upon them to prevent slipping. The front steering wheels are also worked by friction gearing.

[*Printed*, 10*d*. *Drawing*.]

A.D. 1857, August 26.—No. 2261.

ELVIN, Henry.—(*Provisional protection only*.)—" Governors " for steam and other engines."

" The object of this invention is to render ball governors " of steam and other engines more efficient in their action " than heretofore." The upper end of the central rod or spindle of the governor is hollow, " to receive a rod which " carries a weight at its upper end. This rod bears upon the " rising and falling piece or collar which is connected to the " diverging arms of the ball governor and always gives the " collar a tendency to regain its lowest position, and keep up " an ample supply of steam to the engine. In applying this " improved governor to engines used for driving thrashing " machines, it will be desirable to provide balls of different " weights, so that when the corn is damp a heavier ball may " be applied to the top of the governor."

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1857, September 18.—No. 2427.

ANDERSON, Sir JAMES CALEB.—(*Provisional protection only.*) —" Locomotives and other carriages."

The Provisional Specification makes references to drawings but no drawings are appended thereto.

A cylindrical steam chamber is fixed over the boiler and connected thereto by pipes. The object of this is to prevent the tubes or fire box of a locomotive from being uncovered when the engine is on a hill.

A "common road universal railroad" applicable to common road and agricultural engines, &c. is described. The wheels of the engine run on the inside of the rims of larger wheels which may be connected to the carriage, or separate therefrom. The surfaces in contact may be cogged, or a rail on one may fit a groove on the other; or the outer wheel may be deeply flanged, or it may be lined with wood, &c. to prevent slipping.

[*Printed, 4d. No Drawings.*]

A.D. 1857, September 29.—No. 2504.

WELCH, JAMES. — (*Provisional protection only.*) — Carriages for common roads.

The invention relates to a portable railway consisting of an endless chain of rails linked together. The rails are grooved and the rims of the wheels over which the endless railway works fit into the groove. The rims of these wheels may be covered with india-rubber, and the rails may be set with springs "to receive the impact of the conducting wheels." One pair of the wheels is arranged so as to be adjustable in order to tighten the chain. The "bearing wheels are each " a double or divided wheel, with a sufficient space left " between its double periphery and double set of spokes for " the revolution of the conducting wheels, by which means " the conducting wheels may be made nearly to approximate " together, and the length of the chain is lessened." These wheels have double flanges.

The chain may be fitted with a rack, into which a toothed wheel on the axle of the driving wheel can be caused to gear. This toothed wheel can be thrown into and out of gear as required and is only intended for use over difficult ground where the wheels might slip.

[*Printed*, 3*d*. *No Drawings*.]

A.D. 1857, October 6.—No. 2568.

ROMAINE, Robert.—"Machinery for digging or cultivating "land."

The specification describes improvements on the digging machine previously patented on behalf of the inventor. The travelling wheels are fitted with an endless railway. This consists of a horizontal framework suspended on a ball-and-socket joint carried by a vertical rod fixed on the engine frame. This frame carries a number of drums which pass successively under the bearing wheels as the engine advances. A spur pinion mounted on the wheel may gear with a rack on the frame. To facilitate turning at the headlands the driving wheels are fitted with gearing by which the direction of either or both can be reversed. Steam power is applied to steer the machine; this may be employed through gearing or by means of a hydraulic cylinder into either end of which water may be forced by means of steam from the boiler. The power may be applied direct or through the intervention of ropes carried round sheaves. To keep the engine frame horizontal when travelling on an incline the bearings of the leading wheels are fitted with hydraulic plungers, and by means of these the engine frame can be raised or lowered on the wheels. It is preferred to use oscillating steam cylinders. Certain improvements are also described in the digging cylinder, which is raised or lowered by hydraulic power and driven by means of gearing fitted within the cylinder, so that it may be protected from dirt.

[*Printed*, 2*s*. *Drawings*.]

A.D. 1857, October 15.—No. 2637.

BALDERSTON, Robert Glass.—"Apparatus for cultivating "land."

A steam engine mounted on a wheeled frame operating a digging blade or blades mounted at the back of the frame. The crank shaft of the engine has a flywheel on it. From it motion is communicated by suitable gearing to the digger frame. When the digger is at work a slow progressive motion is given to the carriage by means of a ratchet wheel and pall. When it is not at work this is thrown out of gear and a pinion on the crank shaft is put into gear with a spur wheel fast on the axle of the running wheels. A pulley on the crank shaft serves to receive a belt for driving other machinery.

Besides the two main bearing wheels the carriage is supported on a third wheel mounted as a steering wheel.

[*Printed,* 10*d.* *Drawing.*]

A.D. 1857, December 2.—No. 2994.

FOWLER, John, junior, and WORBY, William. — "Apparatus used when ploughing, tilling, or cultivating land."

Portion of the invention relates to hauling apparatus to be connected to a portable engine. A pair of upright drums are mounted on a frame of angle iron. The wheels of this frame are so fitted in a fork, which is itself pivoted to the frame, that they are capable of limited vertical or horizontal motion. On the side frames are racks, which can be placed in gear with pinions on a cross shaft on the engine frame, and by revolving these pinions the drum carriage is brought close up to the engine, when it is bolted thereto. For this purpose the engine is lifted off its fore carriage. A belt from the engine flywheel drives a pulley on the drum carriage, and this by bevel gearing drives the drums. A separate drum is used to move forward the engine and drum carriage by winding on a rope secured to an anchor. The traction rope is an endless one, and clutches, &c., are arranged to drive the drums in either direction as required. When out of use the rope is wound on a separate drum which runs on pulleys on the carriage frame, so that it can be shifted to adjust the weight.

[*Printed,* 2*s.* *Drawings.*]

A.D. 1857, December 26.—No. 3165.

CHAPLIN, Alexander.—Steam engines, &c.

Partly improvements on No. 787, A.D. 1855.

The invention relates to "portable, agricultural, or roadway "engines," and to "contractors' engines." The former class of engine is mounted on a "rectangular timber frame," it is fitted with traction shafts, but the animal power is used principally for guiding, the bearing wheels being driven by the engine. The boiler is upright tubular. The furnace "has upon it a short open tube" "having an adjustable "top with an outlet for the flow of air up through the bars." The "contractors' engine" is nearly similar. Both engines may be fitted with suitable driving gear for thrashing and other purposes. The fire-box has tubes fitted across it, such tubes being higher at one end than the other "to cause the "heated water to flow upwards in a current through the "tubes." The smoke pipe is shaped as "an inverted cone," so that "the heat after passing into it may be rapidly "diffused." This "prevents injurious action of the heat "upon it." Air is driven through the fire by a fan. This air is "distributed over the upper surface of the fire" by "pipes or tubular passages placed in a vertical position "upon the bars," with flat plates over their orifices, on which the air impinges. The cylinders are "arranged over-"head near to the steam chest; the pump and valve chest "form a self-lubricating guide and bracket for the piston "rod, the crank shaft being fitted below." The governor has on its vertical spindle a "loose piece" with grooves fitting the ends of the ball levers. A vertical rod from this operates the throttle valve. Differential gearing is used to drive the bearing wheels. Part of the periphery of these wheels is serrated with teeth the tops of which are flush with the surface of the rim. The steering may be partly or wholly affected by shifting the leading pair of wheels, each wheel "being made to swivel upon its own axis." The coal box and tank may be placed "in the space usually left for the "swivelling of the front pair of road wheels." The engine and boiler may be removed to be used for stationary purposes.

[*Printed*, 4*d*. *No Drawings*.]

1858.

A.D. 1858, February 11.—No. 259.

JOHNSON, Charles, and JOHNSON, George.—"Apparatus "for performing different operations required in agriculture."

The engine comprises an engine, a "propeller" and "carrier" frame, and various implements. The engine is generally mounted on the "propeller frame," while the implements are mounted on the "carrier frame." The engine can also be dismounted from the frame and used separately as a traction engine, &c. The engine and "pro"peller frame" may advance separately, paying out a rope from a drum, by which the implements are drawn up to the engine. The engine "consists of a boiler for generating "steam, and duplicate cylinders, slides, cranks, and fly "wheels."

"The frames are mounted upon wheels having each separate "axles; those upon which the propeller frame is mounted "have axles working in double bearings. One of these "bearings is moveable upon its own centre, and the other "round a curve described by the axle; upon such centre "the wheels are keyed on to the axles and rotate there"with. The whole of the axles are connected by forked "limbs or levers, coupled in the centre and worked by a "screw passing thro' each lever, and thus setting the wheels "at an angle with each other at one operation for turning or "shunting at the headlands or where else required; these "wheels are fitted with drop anchors for increasing their "hold when stationary, and are made with expanding and "contracting panes and felloes, are grooved at the periphery "with a corrugated groove, and are fitted with a break "in which a number of rollers are made to impinge upon "the tire or rim by means of a screw or lever. The "mechanism by which the motion is transmitted from the "engine to the implements consists of corrugated grooved "wheels and chains or cables."

[*Printed*, 1*s*. *Drawing*.]

A.D. 1858, February 11.—No. 263.

THORRINGTON, GEORGE.—(*Provisional protection only.*)—
" A method of propulsion applicable to agricultural pur-
" poses."

" The invention consists in the use of a right and left
" handed screw, placed parallel to each other near the surface
" of the earth, and revolving in opposite directions to each
" other in bearings supported on a suitably contrived frame,
" which is borne on running and guiding wheels. The blades
" of the screws in their revolution take in the soil and so
" effect progression. The screws are set in motion by appro-
" priate gearing driven by steam or other suitable power."

[*Printed, 4d. No Dramings.*]

A.D. 1858, February 23.—No. 356.

BOYDELL, JAMES.—(*Provisional protection only.*)—" Loco-
" motive carriages."

In going round a curve one of the driving wheels is raised from the ground. " A strong arm is mounted on each side
" of the carriage turning at its upper end on a centre fixed to
" the frame; on the lower ends of these arms small wheels or
" rollers are mounted, and when it is desired to turn the
" carriage one or other of these arms is forced down by a
" screw or other mechanical means so as to lift one of the
" driving wheels sufficiently to allow it to slip freely on the
" ground."

[*Printed, 3d. No Drawings.*]

A.D. 1858, March 18.—No. 554.

ANDERSON, Sir JAMES CALEB.—(*Provisional protection only.*) —" Locomotive or other carriages."

1. A cylindrical steam chamber is mounted on the top of the boiler, and connected thereto by pipes. The object of this is to prevent the tubes and fire box being uncovered when the engine is on a hill.

2. A " circular railroad " applicable for " ploughings," carts, agricultural and traction engines, and common road carriages generally, is described. The wheels of the carriage &c. " are to be placed within other wheels of larger diameter,

" so arranged that each wheel will run on the concave surface " of a larger wheel which is to form its railroad." The axle of the large wheel "is to revolve in a box fixed to a frame " placed on the outside of each large wheel." The carriage is connected to this frame by bolts sliding in grooves in the frame. "To turn the carriages," an "inside frame" is to be fitted to "the fore axle tree of each wheel," and this is to be connected to the outer frame by bolts. The outer wheels may also be disconnected from the carriage and have large flanges. Also the surfaces in contact may be cogged, or a groove on the inner wheel may fit a rail on the outer one. The outer wheel may also be lined with wood, &c. to prevent slipping. The steering wheels need not have this arrangement.

3. To "get rid of the opaque appearance" of the exit steam, it is passed through a long coil of pipes and mixed with the productions of combustion from the fire.

4. Improvements in steam passenger carriages.

[*Printed, 4d. No Drawings.*]

A.D. 1858, June 1.—No. 1232.

CHANDLER, Robert Wilson, and OLIVER, Thomas.—Agricultural apparatus.

Among the apparatus figured and described in the Specification, there is "an engine with two longitudinal winding " drums placed on horizontal axes." These are mounted below the engine, and driven by a single bevel wheel in gear with bevel pinions on their shaft. On the shaft of the bevel wheel is a band wheel over which a strap passes from the flywheel. The traction ropes are wound on the drums in contrary directions, "so that when one rope is running off " one drum, the other rope is running on the other drum." Clutches are employed, like those described in No. 1495, A.D. 1856.

[*Printed,* 1*s*. 10*d*. *Drawing.*]

A.D. 1858, June 7.—No. 1276.

SCOTSON, Edmund, and CHARNLEY, Henry.—*(Provisional protection only.)*—" Traction and other engines."

1. The bearing wheels are on independent axles so geared to the crank shaft that either wheel alone can be driven or the wheels may be driven in opposite directions.

2. An "endless railway" is used. A groove in the wheel has in it a chain with "flat V-shaped studs" fitting in slots in "lozenge-shaped pieces" which form the rail. These pieces are "entirely disconnected with each other, and are connected "to the chain only by the before-mentioned flat V-shaped "studs."

[*Printed*, 4*d*. *No Drawings.*]

A.D. 1858, July 1.—No. 1479.

BLINKHORN, THOMAS.—"Steam boilers and engines."

1. "Increasing the heating surface of tubular boilers," by "enlarging the diameter of the tubular flues, and placing "therein water pipes which extend from the water space at "one end of the boiler to the water space at the other end." In locomotive boilers water pipes are carried across the fire box to a "vertical water chamber" in the smoke box at the other end of the boiler. The outer plate of this chamber is removable to facilitate cleaning.

2. The smoke box and chimney are at the fire-box end of the boiler and return flues are used. The flues "also contain "water pipes which connect together the water spaces at the "opposite ends of the boiler."

3. In agricultural engines the cylinders are placed vertically within the shell of the boiler. A "strong saddle piece" on the top of the boiler, carrying the bearings of the crank shaft, also carries the cylinder, which "projects down into the "boiler." The force pump is also carried by a bracket on the boiler. The force pump is "provided with a double set of "valves, so that it may be made to force water both at the up "and down stroke of the piston and therefore by simply "adding an air vessel" and providing a proper exit passage or pipe, "the supply pump of the boiler may be made to act "as a steam fire-engine."

[*Printed*, 10*d*. *Drawing.*]

A.D. 1858, July 14.—No. 1591.

FOWLER, JOHN, junior.—"Apparatus used when ploughing, "tilling or cultivating land by steam power."

The first part of the invention relates to a method of combining winding drums and portable engines. "The bearings

" for the axes of the two winding capstans or drums which " are vertical, are mounted at the ends of a frame, constructed " by preference of angle iron, and in the centre of the frame " between the two axes there is a rectangular opening, and " this opening is of a suitable size to allow the fire-box of the " portable engine used to work the capstans or drums to be " passed down through it. The frame is furnished with " wheels." For use, the hind wheels of the engine are removed and the engine and drum frame are bolted together. " The engine then rests in front on its own wheels, and " behind on the wheels of the capstan or drum frame." " One drum only is proposed to be driven, and that sometimes by upright shaft, sometimes by strap " from the fly wheel passing over a pulley at the side which drives the drum by bevel gearing. The engine moves itself forward by winding up a rope on a drum which can be thrown into and out of gear by a clutch.

In a modification the drum frame is permanently connected to the engine, the drums being as before one behind and one in front of the fire-box.

The traction rope may be arranged in the manner described in No. 2458, A.D. 1858.

The invention also relates to a method of taking up the slack of the traction rope by an apparatus in the tilling implement.

[*Printed*, 2*s*. 6*d*. *Drawings*.]

A.D. 1858, July 21.—No. 1649.

GILES, John Wheatley.—" Locomotive or traction engines."

The improvements refer to engines with propelling legs, and the invention " consists in attaching the jointed levers to " the engine at a point near its centre of gravity," instead of at the end, so that the force may be applied to propel the engine forward instead of tilting the end of it.

The engine to which the invention is to be applied is described with some fulness. The hind wheels are each fitted with a break consisting of " a broad iron band secured to the " spokes of the wheel around which a tightening strap is " passed," this strap being operated by a lever. The engine has two steering wheels, mounted on an " annular plate " which can be revolved by suitable apparatus operated by the engine and thrown in and out of gear by clutches. The leg is secured by a ball and socket joint to the under side of a horizontal "driving beam" which apparently is traversed to and fro between friction rollers. As the beam travels back it acts on a lever which by a connecting rod lifts the leg. The leg may be "furnished with an apparatus for lengthening " and shortening it" and may have a "shoe" or "foot" which "is composed of two portions, one fixed and the other " moveable, and the pressure on the surface of the ground " effects an expansion while the withdrawal of the pressure " produces a contraction."

[*Printed*, 1*s*. 2*d*. *Drawings*.]

A.D. 1858, August 7.—No. 1799.

SMITH, John.—" Agricultural steam engines and locomotive " steam engines to be used on common roads."

1. The boiler is mounted on centres or on a horizontal shaft so that it can be kept horizontal in ascending and descending inclines. The alteration is effected by a screw at one end, working in a bearing on the boiler.

2. The wheels are connected to their axles by a pair of semicircular clips which are fixed on the axle and embrace the nave, being tightened on to it by binding screws. The object of this is that the wheels may be made to run either fast or loose. In turning, one wheel may be loose.

[*Printed*, 6*d*. *Drawing*.]

A.D. 1858, August 27.—No. 1948.

FOWLER, John, junior, and BURTON, Robert.—Common road locomotives.

The axle or axles of the carriage is or are supported each upon a frame, which frame carries on each side a pair of bearing wheels surrounded by an endless railway. The frame is also connected to the body of the locomotive in such a way that it can rock upon the axle which it supports. The endless railway is formed of a series of short sleepers, each having a length of rail upon it, and the wheels have flanges to fit the rail. To support the upper part of the endless chain a supporting pulley is used. " The turning of the carriage is facilitated by

" mounting the bearing wheels in the frames in such a manner " as to allow of their traversing a distance sideways, or in " the direction of their axes." Motion may be communicated to the wheels by means of a band from the crank shaft of an engine mounted on the carriage, which band passes over a pulley mounted loose on the main axle. A pinion fast on this pulley gears with spur teeth formed on the rims of the bearing wheels, which spur teeth also gear into a rack formed by pins in the endless chain. When this construction is employed it is preferred to fit the supporting pulley also with spur teeth.

[*Printed*, 10*d*. *Drawing*.]

A.D. 1858, September 17.—No. 2102.

HADLEY, Charles.—Omnibus, cabs, waggons, &c.

One of the improvements is applicable, amongst other purposes, to traction engines. The axle of the running wheels is " severed into two equal parts, each bent upwards inversely " to its length, forming two separate lengthened loose and " vertical cranks;" to the ends of these a sort of jointed frame is connected, and to this frame a pole is attached. This arrangement is to be fitted " to each or either end " of the engine.

[*Printed*, 2*s*. 6*d*. *Drawings*.]

A.D. 1858, September 25.—No. 2153.

ROMAINE, Robert.—" Steam cultivators."

This is an improvement on the apparatus described in former specifications of the inventor. Some of the improvements are applicable to agricultural steam engines generally, and some others to the engine and driving apparatus of the steam digger described. That the steering wheels may answer more readily to the hand, a re-adjustment is made of the weight of the machine upon the wheels by advancing the crank shaft, and placing it between the driving and steering wheels. The steam cylinders are removed from the bottom of the smoke box, and placed in the rear under the fire-box, which is made cylindrical instead of square, and set within the shell of the boiler. " To avoid the danger of the inside fire-box not being " covered with water when the engine is descending inclines," an inclined plate is fixed inside the boiler, " which extends from " the smoke box end of the boiler to a point above the fire box; " this forms a steam chamber which dips a little below the " water line at the smoke-box end, and rises gradually above " the water line as it proceeds towards the fire-box end of the " boiler, where it terminates in an open mouth. This chamber " allows the globules of steam to rise freely to the surface of " the water, and the steam as it is generated enters the " chamber on its way to the steam dome," which " is divided " into two compartments, so as to obtain two separate streams " of steam to the cylinders by two distinct induction pipes;" the water tanks form a prolongation of the smoke box. To prevent the wheels slipping, an " arrangement of rotary spades or " picks " is mounted so that " they will form an abutment for " stud pins or bolts projecting laterally from the rim of the " wheels " or from the sides of the endless railway where one is used. To facilitate turning, a " portable turntable " is used, of two circular plates with or without antifriction rollers between. An " adjustable dead weight " is used to raise the digging cylinders. The inventor proposes to " simplify the steering " apparatus by dispensing with the self-acting clutches and " springs on the upright spindles of the front wheels by pro- " viding sliding bearings of the transverse shaft that carries " the two worms, and throwing it and the two worms out of " contact with the worm wheels, thus relieving the steering " wheels from any controlled action in turning round."

[*Printed,* 1*s.* 8*d.* *Drawings.*]

A.D. 1858, September 25.—No. 2156.

HALL, Collinson.—" Apparatus for applying power to the " cultivation of the soil."

One part of the invention refers to the winding drums of agricultural engines. Below the engine frame, pivoted vertically thereto, are " a single drum or pulley upon one axis and two " or more drums or pulleys upon another." The traction rope " is so passed round the drums or pulleys that one of the " two or more which are upon the same axle turns in a direc- " tion opposite to that of the others." In the drawing, each of the small pulleys takes one coil of the rope, which is wound in an 8 over these and the large pulley. The single large pulley is the driven one. Guide pulleys are arranged to keep the rope in its place. The object of the arrangement is to provide greater adhesion between the rope and the pulleys.

[*Printed,* 10*d.* *Drawing.*]

A.D. 1858, October 7.—No. 2227.

THURNHAM, CHARLES HENRY.—(*Provisional protection only.*) —" Mechanical arrangements to be adapted to the wheels of " locomotives, carriages, and other vehicles."

The invention "consists of a peculiarly constructed ring, " which can be slipped over the tyre of the ordinary wheels," and "is retained in its situation by being channelled, so that " the carriage wheel can work therein and while itself " rotating will rotate the external ring, which thus becomes " a kind of annular railway."

[*Printed,* 3*d.* *No Drawings.*]

A.D. 1858, October 13.—No. 2279.

PARKER, HENRY.—" Apparatus for the cultivation of land " and other agricultural operations."

A steam cultivator is described. A portable steam engine is mounted on two sets of rollers. The hinder set are fitted with tines for cultivating purposes, the outer roller on each side being driven by a pinion engaging with a ring of teeth on the roller. The pinion is driven by suitable gearing from the engine, a friction connection being used which yields to excessive pressure. The forward rollers are used for steering being operated by a screw and worm wheel. The frame which carries them is adjustable vertically by a screw, so that the front of the engine can be raised or lowered to suit uneven ground. The weight is borne by a helical spring, surrounding the screwed shaft.

The tire roller may have wooden felloes bolted on it for purposes of transport when the engine may be used as a traction engine or for thrashing, &c., a driving pulley being for this purpose mounted on the main shaft.

In a modification the forward rollers are also driven. This is effected by bevel gearing on a vertical shaft mounted between the two central rollers.

A "complete double cylinder engine" may be mounted on each side of the machine, the engines have separate crank shafts, and can be reversed as required in turning and guiding the apparatus.

[*Printed*, 1*s*. 4*d*. *Drawings*.]

A.D. 1858, November 3.—No. 2458.

FOWLER JOHN, junior, **BURTON, ROBERT**, and **GREIG, DAVID**.—" Applying motive power to actuate ploughs," &c.

The first part of the invention relates to methods of turning the implements and raising the tilling tools. The last part relates to the winding drums of agricultural engines. Instead of mounting both drums under the boiler between the fore and hind pairs of wheels, one drum is placed in this position, and the other "between the two fore wheels immediately over the " locking motion; one only of these drums is driven by the " engine, and the rope is passed round the pair of drums in " an oval coil, thus O." "To obtain sufficient bite on the " rope," "the rope, which ordinarily is led away from the " loose drum, is again passed round the driven drum, and is " brought out between the two drums." "In whichever way " the engine is winding, the rope passes on to the driven drum " before it comes on to the loose drum." In the drawing, the hindermost drum is the driven drum. This drum has by preference three grooves and the other two. In a modification (also described in No. 216, A.D. 1859) a third drum is mounted under the fire box. The rope first passes three quarters round the driven drum, then half round the two end drums in succession, and then again three quarters round the driven drum.

When two drums are used with the rope coiled over both, the axis of one of them is "in some cases" set horizontally or inclined, instead of being vertical.

[*Printed*, 1*s*. 4*d*. *Drawings*.]

A.D. 1858, November 10.—No. 2522.

HUMPHRYS, EDWARD.—" Steam engines and boilers."

The invention relates principally to marine engines.

Engines for common roads have "a pair of engines to each " driving wheel," so that the wheels may be driven independently. The cylinders are placed in the smoke box, and the moving parts are surrounded with "a cistern which is filled "with lubricating materials, so that the moving parts may be "immersed therein." The tube case of the boiler is rectangular instead of cylindrical, and is strengthened with stays across.

[*Printed*, 1*s*. 4*d*. *Drawings*.]

A.D. 1858, November 13.—No. 2548.

TAYLOR, James.—"Traction engine and portable engine for "agricultural purposes."

The engine may be mounted on four or six wheels. In the latter case the leading and trailing wheels are joined by connecting bars; in the former the leading wheels are used as steering wheels. A number of "distinct or hollow or box like "feet" are mounted round the periphery of each driving wheel, so that they are projected radially outwards by springs. The amount to which the feet are projected is regulated by the hardness of the ground. The feet may also be projected "by means of a peculiar guide bar placed so as to cause the "points of the teeth to move in a horizontal line when in "contact with the ground." "Two or more inverted "cylinders" are used which act through gearing instead of direct on the wheel axle. A winch may be mounted on the engine frame, so that the engine can be thrown into gear therewith. The driving wheel has by preference an internal spur wheel on it and a pinion in gear therewith, this pinion being driven from the engine by "a chain which lies in a "horizontal or nearly horizontal position." A short boiler is used "having its furnace and internal arrangements somewhat "similar to marine boilers." An intermediate shaft may be used for actuating the driving wheels, and on this shaft is one of several "mechanical contrivances or arrangements," described and figured, "for enabling the two driving wheels "working upon the same line of axle to vary their velocity "when turning a corner." These "mechanical contri-"vances" consist of various arrangements of bevel and spur wheels.

[*Printed*, 1*s*. 8*d*. *Drawings*.]

A.D. 1858, November 27.—No. 2701.

BURRELL, Charles.—"Traction engines and carriages."

The wheels are fitted with a "portable railway." This consists of a series of shoes, each attached to the wheel by an " **A**-formed bar or projection" about its centre. The rims of the wheels are of trough or angle iron and have spaces into which the projection passes. The wheels have two sets of spokes. The shoes have rails on them for the wheel to run upon. They are driven by pinions on the crank shaft gearing with spur teeth on the wheels, and to bring these pinions in and out of gear the entire frame of the engine is raised and lowered, at one side or both sides, by screws. The front of the boiler can be raised and lowered by a screw to keep the water level in going up and down hill. The front wheels are operated for steering by a hand wheel and rack.

[*Printed*, 1*s*. *Drawings*.]

A.D. 1858, December 9.—No. 2828.

WILSON, John.—"Machinery for tilling and cultivating " land."

"For these purposes a chain or rope is employed which has " an anchor" "at each end, so as to hold the same fast at " or near the headland." A carriage, to which the ploughs, &c. are attached has on it an engine and boiler, also a winding drum driven by the engine, over which the above chain passes. A cylinder set horizontally on the top of the boiler gives motion to a crank shaft which by bevel gearing drives an inclined shaft having a worm on its lower end. This worm drives a worm wheel on a transverse shaft below the boiler. On this shaft are chain wheels whence the bearing wheels are driven for use on common roads. The wheel over which the chain above described passes is also on this shaft. "The chain " used is conducted partly around the chain wheel by suitable " guide wheels, so that as the chain wheel is caused to rotate, " it will on the carriage passing from one headland to the " other, progressively pick up and again deposit the chain, " and the end of the chain from which the carriage is for " the time being moving will have its anchor" "moved, so " that in the next bout the carriage and implements will act

" on a fresh portion of the land; or in place of a chain and " chain wheel, a rope and pulley or drum may be employed." To avoid the necessity for turning at the headlands, it is preferred to use two sets of ploughs, &c., one set being attached at each end of the carriage, and provision being made for raising and lowering them alternately.

[*Printed*, 1*s*. 2*d*. *Drawings*.]

A.D. 1858, December 27.—No. 2964.

HORNSBY, Richard, junior.—" Ploughing and tilling land " by steam power."

1. The winding drums of agricultural engines are mounted in such a position that they " can be driven from the crank " shaft of the engine by straight spur wheels or straight " gearing without the intervention of bevilled wheels, chains, or " straps." The drums are mounted " on tubular axes through " which the axles of the bearing wheels pass excentrically" or on stud axles at the sides of the engine. There are clutch boxes " immediately on the drums, or else on parts running at " the same low speed as the drums."

2. The winding drums may be on a separate carriage, the crank shaft being connected with the driving shaft of the drums by a shaft with universal joints thereon. This carriage is furnished with disc wheels on sliding stems which can be forced into the ground by a rack, to anchor the carriage; or coulters may be similarly employed; weighted levers with coulters on them may also be used for the same purpose. The carriage has a winding drum for hauling itself forward. This may be upon the same shaft as the other drums. The clutch of this drum is of the ordinary character. Those for the other drums are " placed interior of the drums and they " are connected together by feathers laying in grooves made " from end to end of the axis" " and the feathers are " continued on and fixed to the ring" " which receives the " fork for working the clutches; the feathers do not rise above " the surface of the axis, except at the points where they are " connected with the clutches, otherwise they would not be able " to slide through the bearings and side plates of the drums; the " clutches," " are furnished with projections, and when the " clutch lever is pushed to its extreme position in one or

" other direction, the projections of one of the clutches enter " openings made in the side plates of the corresponding " drums."

The rest of the invention refers to traction ropes, a system of ploughing, pulley carriages, and ploughs.

[*Printed*, 3*s*. 10*d*. *Drawings*.]

1859.

A.D. 1859, January 12.—No. 91.

BRAY, WILLIAM, and BRAY, WILLIAM THOMAS GEORGE.— " Locomotive and traction engines."

The object of the invention is to enable the power of the engine to be communicated to the driving wheels through pinions, the engine being mounted on springs, without injury to the pinions from the wheels rising and falling, while the pinions have not the same movement. " A link is connected " from the axle of the driving wheel to a lever carrying two " more pinions at or near to the crank shaft or to the axle of " the second pinion or at some intermediate position." These pinions are so geared to the crank shaft as to give different. speeds. " The axle of the driving wheel may work up and " down in a guide, or may be guided by a link or lever." " When a link or lever is used it may be connected to or form " one piece with the aforesaid link or lever, so that the " whole may turn on one fulcrum, and may serve to guide the " wheel and carry the pinions." " The fulcrum may be " placed at the level of the axle, or at the level of the crank " shaft, or at some intermediate position." The lever may also work in a slot or on a guide " while the upper end is " guided or controlled by a link placed in a horizontal or " nearly horizontal position, so as to cause it to move in a " vertical direction." The front part of the engine is " supported by a pin which rests on a clip embracing the " centre of a spring which is suspended from the arch." " The front axle passes through a box or case attached to the " under locking plate, but is free to move up and down at

" either or both ends to a sufficient extent to accommodate " itself to the inequalities of the road."

Reference is made to No. 3102, A.D. 1856.

[*Printed*, 1*s*. *Drawings*.]

A.D. 1859, January, 13.—No. 120.

BARRANS, JOSEPH. — " Traction and portable steam engines."

" To support the weight of the boiler and the steam cylin- " der or cylinders, a beam or lever is applied at the under " part thereof; the hinder end of this beam or lever moves on " an axis the bearings of which are fixed to the boiler." The smoke-box end of the boiler is supported on a spring in a box mounted on this beam. The fire-box end of the boiler is mounted on springs on the hind wheels. " The fore end of " the lever beam is formed into an axle on which the fore " carriage and locking motion are arranged to turn, so as to " admit of the fore axle inclining to the one side or to the " other in the event of passing over an uneven surface. The " driving wheels are driven by pinions gearing into cog " wheels fixed to the driving wheels, and by preference there " are two sizes of pinions used, so as to give at different " times different speeds of driving, and when such is the " case it is preferred to have the cog wheels which are " fixed to the driving wheels cogged on their inner and outer " surfaces, and in order to keep the axle of the driving wheels " and the axes of the pinions correctly distanced they are " connected by suitable links on framing, and the two pinions " which drive either of the cog wheels are arranged in such " manner that when the slow speed is desired, the pinion on " the axis which receives its motion from the engine slides on " its axis out of gear with its cog wheel into gear with an " intermediate wheel which is on the axis of the other pinion, " and the axis of such pinion is moved into and out of position " by an eccentric or otherwise." The driving and fore wheels are made of separate rings, some of which may be mounted so that they can be shifted eccentrically, and one or more rings may be in contact with the ground. The rings have projections on them which hold the ground, the projections alternating on adjacent rings.

The steam is superheated in a casing surrounding the chimney whence the steam pipe is led to the cylinders.

[*Printed*, 10*d*. *Drawing*.]

A.D. 1859, April 18.—No. 983.

BOYDELL, James.—(*Provisional protection only*.)—"Apparatus applied to the wheels of locomotive, traction, and other "carriages."

The wheels are flanged and run on short lengths of rail carried by separate plates "connected with the wheels in such "manner that as the wheels revolve the bearing plates are "lifted, carried round by the wheels, and deposited in succession in front," after the manner described in the Specifications of previous patents by the inventor, including No. 11357, A.D. 1846, and No. 431, A.D. 1854. The ends of the rails are so made that they fit into one another. There are "two sets of guide plates similar to" those described in the second of the above mentioned Specifications, and "two "sets of what are called triangular bars, which work through "the guide plates." Certain of these bars are "curved or "cycloidal;" they are so fitted as to be capable of "moving "somewhat to and fro," and they are "connected together "in pairs at their upper ends."

[*Printed*, 3*d*. *No Drawings*.]

A.D. 1859, April 25.—No. 1041.

TAYLOR, Samuel Lawrence.—(*Provisional protection only*.)—Agricultural implements and engines.

The portion relating to agricultural engines consists of the following improvements:—

1. A rotary engine is "formed by a solid cylinder, or it may "be cast hollow and with suitable arms and centre to fix it on "its axis; this cylinder has cavities in its periphery, which is "partially covered by a segmental case suitably packed and "held up to the periphery. It is furnished with steam passages which regulate the admission and exit of steam to the "cavities in the periphery, which admission and exit of steam "to and from the cavities impel and give rotary motion to "the cylinder."

2. "Heating the feed water and at the same time protecting "parts of the boilers." The smoke box is partially surrounded by a water tank, and the end of it is formed of a double casing containing water. There is also "a tube "through the body of the boiler from the fire-box to the "smoke," in which are "a number of small pipes which form "the passage of the feed water from the pump to the boiler, "while the enclosing tube forms the eduction of the steam "from the cylinder."

3. There is a "water partition from back to front of the fire "box" with a blow-off valve. The fire-box doors also have water compartments.

4. In "a chamber below the body of the boiler behind the "furnace," "are a series of small tubes through which the "products of combustion pass, as also around the chamber "which is connected with the main body of the boiler" by tubes capable of being moved for repairs.

[*Printed, 4d. No Drawings.*]

A.D. 1859, May 14.—No. 1208.

LEAHY, MATTHEW.—" Apparatus for facilitating the draught "of carriages."

A pair of disc wheels are mounted on eccentrics on the axle of each bearing wheel, one on each side of the wheel. These disc wheels carry an endless chain of short lengths of rail, the lengths of which are connected together by metal links, vulcanised india-rubber, &c. The eccentrics are set so that the endless chain clears the bearing wheel at all points except at the surface of the ground. The bearing wheels may be flanged or not. If necessary rims of india-rubber or other soft material may be fitted on the disc wheels to prevent noise and jarring.

[*Printed, 10d. Drawing.*]

A.D. 1859, May 18.—No. 1234.

BRENNAND, JOHN.—(*Provisional protection only.*)—Carriages, &c.

One part of the invention relates to "a mode of assisting "steam carriages by constructing them with rods worked "directly by steam cylinders and striking or pushing on

" the ground at a suitable angle, or by the use of levers of
" wood or metal applied to the backs of the wheels in such a
" manner as that when motion is given to them they will
" lift the wheels forward."

[*Printed, 3d. No Drawings.*]

A.D. 1859, May 21.—No. 1256.

SAVAGE, William Peacock.—(*Provisional protection only.*)—
" Traction steam engines and machinery for moving agricul-
" tural implements."

The boiler is pivoted at its hinder end to the frame, and its fore part can be raised and lowered by screws. The crank shaft has on it a fly wheel and riggers for belting. The bearing wheels are driven by pinions on the crank shaft. A winding drum is driven by pinions on the crank shaft gearing with wheels on a second motion shaft carrying chain wheels whence motion is communicated to the drum.

The engine may therefore be used as a traction engine, for working stationary machines, or for working agricultural implements. It is steered by a wheel at the back acting on suitable apparatus in front. The hind wheels have on them " shoes or surfaces" attached by springs, " and then as the
" wheel moves off the shoe or surface which for the time is on
" the ground, the spring in connection therewith will in regain-
" ing its ordinary position aid in propelling the wheel round."

[*Printed, 4d. No Drawings.*]

A.D. 1859, May 30.—No. 1333.

BLACKBURN, Isaac, and BLACKBURN, Robert.—Traction engines and instruments connected therewith.

Improvements on No. 414, A. D. 1857. To the trunnions of a large travelling drum or to the main shaft supported in its centre, a frame is connected rigidly. This is " brought out to
" the front or back of the drum, and forms a lever whereby
the drum may be turned" ; the frame also supports the steam cylinders. The drum is driven from the outside by toothed gear, the boiler is placed inside the drum and the steam is conveyed from it to the cylinders through one of the trunnions. The boiler is fed through the other trunnion, or the boiler and cylinders are mounted outside the drum, and the water tank

and fuel bunker are set inside the drum. The surface of the drum is formed of corrugated plates; or other uneven surfaces to grip and not slide on the soil; for travelling on rails flanged tyres are applied on the drum. The pinions for driving the drum from one or both sides slide backwards and forwards on their spindles to take them entirely out of gear, that the drum may be stationary when the engine is used for hauling implements or for thrashing.

For cultivating, the inventor employs "rotary cultivators " consisting of a cylinder or cylinders placed behind the " drum" " and made to rotate by its onward motion through " the spur or bevelled gearing on the outside of the drum." " The cylinders are armed with straight or bent tines." " Hauling apparatus is fitted on the guide frame for the pur- " pose of drawing or hauling ploughs or other implements in " hilly districts where the locomotive would remain station- " ary." One of the drawings shows a cylinder mounted at the back of the engine, and driven by an inclined shaft, on one end of which is a pinion gearing with a spur wheel on the face of a pinion gearing with a similar wheel on the tine cylinder. " The depth at which the tines work in the ground " can be regulated at will, and arrangements are provided " for raising the cylinder wholly out of the ground when it is " not required for use."

[*Printed*, 1*s*. *Drawing*.]

A.D. 1859, June 7.—No. 1389.

DORMAN, William Henry, and COWPER, Charles.—(*Provisional protection only.*)—"Traction and locomotive " engines."

The engine is mounted on springs. The main axle is driven by cranks from a shaft geared to the crank shaft. On the main axle is "a combination of three or four bevil wheels, " which is sometimes called a 'jack-in-the-box' or differen- " tial box." "One or two of these bevil wheels are carried " round by the axle, and carry with them the other two bevil " wheels fixed on or connected to the wheel boxes or naves of " the two driving wheels respectively. Both wheels are thus " driven; but if one is stopped or retarded, the other one is " still driven and the engine is thus enabled to turn corners

" with facility." "More than two intermediate wheels" may be used in this arrangement. The axle may also be driven by chains from a chain wheel on the crank shaft to a large wheel on the axle, pulleys being arranged so that the "upper and " lower straight parts of the chain leading to and from the " aforesaid large chain wheel may be parallel" and horizontal. " Three small chain wheels at different levels" may be used. By means of a clutch these wheels may be caused to drive the axle at different speeds.

The wheels employed are those described in No. 3102, A.D. 1856. "When the blades of these wheels are governed by an " excentric, and it is wished to give elasticity to their action," two rings are placed round the eccentric, one within the other, and having springs between them. Or there may be "a separate " spring to each blade" or the eccentric may be fitted with springs. A blower is used to urge the fire, and the chimney is shortened. The boiler has "a shorter barrel and shorter " tubes than are generally used." The fire-box is between the fore and hind axles. The crank shaft and gearing are between the two axles, or behind the main axle. The connecting rods may be attached directly to cranks on the main axle.

[*Printed, 4d. No Drawings.*]

A.D. 1859, June 9.—No. 1402.

BURNESS, William.—" Steam culture machinery."

The invention comprises 18 heads, of which 9 refer to engines and drums. There are no drawings, but the inventions are all described at considerable length in a specification of 26 pages.

1. "Strengthening the boiler & working parts by placing " them in framing having bracing straps of its own, exclusive " of straps cooled on to the rivet joints." This framing may " extend beyond each end of the boiler. The fire box may be at either end. The framing " may also rise above the boiler " at each side & may support a carriage or van" for conveyance of anything required.

2. Improvements in winding drums as described under heads (3) to (9).

3. The winding drums have a to-and-fro motion by rack-work or otherwise.

4. "One, two, or more vertical drums in one or more planes "may be placed on one side of the boiler, or both sides or "both ends," with guide pulleys.

5. A "large horizontal plain drum," or a vertical drum, may be mounted below the boiler or on a separate carriage. A friction brake holds the rope against the drum.

6. The windlass may be connected to the engine so as to be capable of being moved therewith.

7. The windlass can be removed when the engine is required for other purposes.

8. Springs are used in connection with winding drums. The drum is "prevented from making a complete revolution by "means of two or more arms fixed upon the same axle in the "interior of the drum coming in contact with the springs & "compressing them."

9. Springs are also used in engine fly-wheels, drums, &c. The spur wheels of the engine are by preference of cast iron, with wooden or brass teeth.

[*Printed*, 1*s*. *No Drawings.*]

A.D. 1859, July 7.—No. 1613.

KNOWELDEN, John, and EDWARDS, Downes.—"Hydraulic engines and pumps."

Various improvements in these are described. The inventors say:—"In applying portable hydraulic engines for motive "power for various purposes, we employ flexible pipes or "tubing to supply the water, by which means we can employ "such engines for," among other purposes, "working agri-"cultural machines and implements." No other part of the Specification appears to refer to this series, unless it be a reference to use of an expanding drum for hauling and hoisting purposes, in order to "adjust the weight to be moved pro-"portionate to the pressure on the crank pin."

[*Printed*, 10*d*. *Drawing.*]

A.D. 1859, July 13.—No. 1659.

THOMSON, James Strang.—(*A communication from Henry Blandy and Frederick T. L. Blandy.*)—(*Provisional protection only.*)—" Steam engines."

The invention refers to agricultural and other portable engines. A horizontal tubular boiler is mounted on pedestals. To its upper side is bolted a " hollow bed plate," which carries the working parts. The cylinder is at the fire-box end, and the crank shaft at the smoke-box end. The hollow bed plate may serve to heat the feed water, the waste steam pipe being carried through it, or the waste steam being discharged into it. "Both the inside and outside fire-boxes of the engine are " oval in transverse section." "The inside box is entirely " covered or surrounded by water, and the lower side of both " is quite open, so as to secure a large extent of grate surface." "The upper portion of the external fire-box is " cylindrical," and "the top of the inside fire-box is flat or " oval." "The slide valve is worked by an eccentric on the " main shaft operating a slotted lever or link motion."

[*Printed, 4d. No Drawings.*]

A.D. 1859, July 14.—No. 1670.

LONGSTAFF, Richard, and PULLAN, Abraham.—"Traction " or locomotive engines,"

The cylinders, &c., are mounted on a "vibrating frame or " platform," instead of being fixed on the boiler. This frame " is connected to the horizontal foundation frame by a " pin stud or spring at one end, so that this frame may " vibrate or move thereon." The other end of the frame is attached to a strong spring. The boiler is on the same frame. The running wheels have wrought-iron spikes and cast-iron naves. The felloes are of wood, secured by an iron tire. To increase the bearing surfaces of the wheels, " additional side " wheels are adapted thereto in such a manner as to admit of " these additional wheels being brought down on to the surface of the ground or raised up therefrom when required. " For this purpose these side wheels are mounted in levers " suspended at one end from the foundation frame, and provided at the opposite end with a vertical adjusting screw " which passes through screwed bearings also attached to the " foundation frame." Blocks on these wheels engage with pins on the main wheels, so that they rotate together. The additional wheels have studs on them, with vulcanised rubber between them.

Instead of the above arrangement, one end of the boiler may be secured to the framing of the steering apparatus, while the other end is supported on "a spring beam or framing con-" nected with the driving wheels."

Instead of levers to raise and lower the side wheels, these may be mounted "eccentrically in discs or wheels, and by " causing these latter to rotate by any suitable mechanical " contrivance, the side wheels will be raised or depressed as " may be required."

The steam cylinders, &c., may be mounted on a "vibrating " frame" supported by a horizontal shaft passing through the smoke-box, &c., and by the axle of the driving wheels.

The cylinders, &c., may be mounted on "this spring framing " of the steering carriage, the opposite end of this framing " being attached to the axle of the driving wheels," &c.

The steering "is effected by means of parallel screws" operated by a hand wheel.

The bearing surfaces of the driving wheels may be constructed in the same way as the additional wheels.

To prevent noise, some of the spur gearing is made with wooden teeth.

To keep the boiler level when on an incline, it is mounted upon " adjustable trunnions."

The cranks are forged separate from the shaft, and keyed thereon.

[*Printed,* 1*s.* 10*d.* *Drawings.*]

A.D. 1859, August 19.—No. 1908.

FOWLER, John, junior, BURTON, Robert, GREIG, David, junior, ALLEN, Edward Ellis, and WORBY, William.— " Improvements in ploughs, cultivators, or tilling implements, " and in machinery for giving motion to the same by steam " power."

A grooved pulley is mounted loose on the crank shaft, and receives its motion by spur wheels gearing with a ring of spur teeth on it. Below this on each side is a set of small pulleys in a swinging frame pivoted to a bracket fixed to the boiler. A second drum is mounted loose on the axle of the hind bearing wheels. The rope passes under the boiler, over one set of small pulleys, over the drum on the crank shaft, over the second drum, back to the first, over the second set of small pulleys, and under the boiler again. Any suitable number of coils is taken over the two large drums. Single larger pulleys may be substituted for the sets of small pulleys, and the rope then passes in the other direction.

Or a single drum may be used. It is mounted under the boiler on a vertical shaft, and has a number of small pulleys surrounding it. The rope is led first round the drum, then over all the small pulleys, and then round the drum again.

A lever mounted on the top of the boiler is connected to the piston of a steam cylinder, so that it is constantly forced upwards. On the end of the lever is a pulley over which the traction rope passes, and is thereby kept taut.

The grooves of winding drums are lined with vulcanised rubber, copper, or soft metal. The grooves may also be formed with indentations to fit the strands of the rope. A packing of hemp, &c., may also be fitted to the grooves. The drum may be cast cylindrical with only one flange, rings of iron with packing material between being placed on the drum and screwed up. The grooves are formed by the iron rings. The metal lining is riveted or cast on. One large drum may be used, which winds upon it the traction rope at one end, giving it off at the other. The drum always contains on itself a third of the length of rope in use. This drum is by preference mounted on a separate carriage, and driven by a band from the engine to a pulley on a shaft geared to the drum. Or two drums on one vertical axis may be used. These are driven alternately by means of clutches, and are mounted on the engine.

[*Printed*, 2*s*. 10*d*. *Drawings*.]

A.D. 1859, September 1.—No. 1995.

AVELING, THOMAS.—" Locomotive engines."

The invention refers to various methods of regulating the tension of endless chains used for locomotive, common road, agricultural and other engines.

Three modifications are described:—

1. " The axis of the small chain pulley which transmits " motion to the endless chain passed round a larger chain " wheel on the hind running axle of the engine, is capable of

" lateral adjustment in a curved slot in the main supporting " bracket which carries the plummer blocks of the engine " shaft, the curve of the slot being struck from the centre of " the main shaft. By this means the spur wheel and pinion " employed for actuating the small chain pulley will not be " affected by the lateral adjustment of such pulley." The adjustment is effected by a screw bearing against the side of the pulley spindle.

2. The pulley driving the chain is mounted "within a " quadrant arm or lever working freely at one end round the " main driving shaft of the engine, and having a slotted " quadrant at the other end whereby it may be set in any " desired position requisite for imparting more or less tension " to the chain by drawing the small chain drum or pulley " further from or nearer to the driving wheels." A pinion on the pulley spindle gears with a wheel on the main shaft, in whatever position the pulley may be placed. The quadrant is fixed as required by bolts and nuts.

3. The axle of the bearing wheels is shifted laterally in slots in the supporting brackets.

The wheels are fitted with moveable "projections made of " T angle iron in the form of clips" to increase the bite of the wheels on the ground.

[*Printed*, 1s. 2d. *Drawings.*]

A.D. 1859, September 27.—No. 2187.

BEARDS, Thomas.—"Ploughing and cultivating land by " steam power."

Part of the invention refers to the winding drums of agricultural engines. A pair of drums are mounted on a horizontal shaft at the back of the engine, the shaft being by preference mounted in a frame which can be detached from the engine. They are driven by a chain from a chain wheel on the engine crank shaft to one on the drum shaft, the sizes of wheels being so arranged that the crank shaft makes several revolutions to each one of the drum shaft. The rope is led under a flanged roller of the same length as the drum and carried by a parallel spindle below the drum shaft.

[*Printed*, 8d. *Drawings.*]

A.D. 1859, September 28.—No. 2192.

DORNING, William John.—(*Provisional protection only.*)—
" Traction engines."

The invention " consists, first, in supporting or building the " moving power, that is the cylinders and mechanism con- " nected therewith, upon an iron framework, either above or " below, entirely independent from the boiler." Secondly, in mounting " or balancing the boiler upon a pivot, shaft or " axle placed about midway between its ends, upon which the " boiler may be moved so as to be enabled to give certain " inclination thereto, that the boiler may assume a horizontal " position when the engine is ascending or descending inclined " surfaces; the said axle or bearing is made hollow, and the " steam is supplied through it to the engines." Thirdly, in raising or lowering the ends of the boiler, " by means of screws " in connection with and actuated by the power of the engine " through an arrangement of wheels and clutch-box gearing. " The axle of the traction wheel in connection with the shaft " of the gearing above may be supplied with springs, and the " engine may also be arranged on the above principle without " any gearing. The traction wheels when worked by inter- " mediate gearing may be arranged to work both single and " double gear from both sides, or from one side independent of " the other."

[*Printed, 4d. No Drawings.*]

A.D. 1859, November 10.—No. 2561.

DAY, William. — (*Provisional protection only.*) — Utilizing wind power.

The first part of the invention relates to the use of a feathering paddle-wheel for marine propulsion; the second relates to the use of a wheel of similar construction as a wind-mill. Such a wind-mill may be employed for various agricultural purposes, including thrashing, " obtaining a draught motion " for ploughing land," &c. For such purposes the wheel is to be " fixed to a suitable stand mounted on wheels, by which " it may be moved or shifted either by its own power or by a " horse or horses." No special construction for the wheel in question appears to be described.

[*Printed, 3d. No Drawings.*]

A.D. 1859, December 12.—No. 2817.

STIRLING, PATRICK.—" Traction engines."

The engine is mounted on " a single central vertical driving " wheel, a pair of leading wheels and a pair of trailing " wheels." The frames carrying the leading and trailing wheels are mounted so that they are turned simultaneously in opposite directions to steer the engine. This is effected by right and left-handed worms on a shaft gearing with teeth on a circular rack on each frame. The boiler is mounted on the frame of the leading wheels, the working parts of the engine on that of the hind wheels. The crank shaft has on it a pinion which gears with a ring of teeth on the driving wheel. " All the wheels are mounted with springs, and an " adjustable contrivance is applied to the driving wheel " springs, by means of which the weight of the machine may " be made to bear more or less exclusively upon the driving " wheel." The "treading surface" of the driving wheel is formed of blocks of wood "jammed in between the iron " cheeks and presenting a circumferential surface of end " wood." Spikes, ribs, &c. may be added in order to increase the hold of the wheel upon the ground.

[*Printed,* 10*d.* *Drawing.*]

A.D. 1859, December 23.—No. 2932.

GILES, JOHN.—" Locomotive traction engines."

" The chief feature in these improvements consists in the " embodiment of the principle of animal traction in con- " junction with a constant rotatory motion." " The following " is the mode of obtaining the above result:—At each side of " the engine or boiler is fixed a stud, pivot, or other similar " apparatus upon which works a lever or flat bar. The stud is " fixed at a point on the engine forward of the axis of the draw- " ing [driving] wheel, and the lever or bar is in an inclined or " slanting position passing backwards to the driving wheel, " the axle of which passes through the other extremity of the " lever which is thus made to serve as a bearing. Between " the driving axle and the engine is introduced a spring " for the purpose of rendering the movement of the engine " easy and free from jolting."

The drawing shows several views of a driving wheel thus fitted. A ring of teeth on the wheel gears with a pinion presumably driven by the engine. This pinion is mounted on a lever carried by the side of the driving wheel. The pinion may also impart motion to the driving wheel by an endless chain.

[*Printed, 8d. Drawing.*]

A.D. 1859, December 23.—No. 2933.

AVELING, THOMAS.—(*Provisional protection only.*)—Locomo-
" tive engines."

The invention relates to a "mode of taking up the
" slack in the endless chains bands or belts employed
" in driving the running wheels of traction and other
" locomotive engines, and consists in putting the axle of the
" driven wheels of the engine into a slotted bearing which
" will admit of such axle being moved laterally so as to
" take up the slack of the chain where it occurs. Another
" part of this invention relates to a peculiar construction of
" flat-linked or open chain applicable generally to the trans-
" mission of motive power, and consists in connecting each
" pair of flat links with an intermediate solid link or block
" of the full width of the opening between the flat links;
" these solid links or blocks are made of ordinary cast iron
" or of malleable cast iron, and have the link or joint pins
" of the chain cast therein, these pins being made of wrought
" iron or steel."

[*Printed, 4d. No Drawings.*]

1860.

A.D. 1860, January 18.—No. 129.

CHAPLIN, ALEXANDER.—"Engines for drawing or conveying
" heavy loads."

The invention consists in so arranging traction engines that when the engine cannot draw its load in the ordinary way, it may advance by itself and draw the load up to it, or may wind itself and the load up to a fixed point ahead. For this purpose suitable hauling drums are mounted on the engine, either on the driving wheels axle, in which case the wheels have to be raised off the ground by crutches or otherwise, or in any other suitable way.

The engine and boiler are by preference of the sort described in No. 3165, A.D. 1857, and No. 866, A.D. 1859.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1860, January 24.—No. 179.

CARTER, Joseph Threlfall. — Agricultural engines and implements.

The invention refers to a steam engine intended to give motion to a digger, but it is mounted on a separate frame and wheels, so that when the digger is not required to be in use the engine may be used for other purposes. There are two furnaces, one at each end of the boiler. The tubes from each furnace are led twice through the boiler before discharging into the flue space formed between the two boiler shells and leading to the chimney in the middle. In the space between the two furnaces is fitted a fan blower and a water cistern. The waste steam is passed "through an outer casing " to the blower, wherein it becomes more or less condensed " and is returned to the cistern." There are two vertical cylinders set within the boiler. The piston rod of each of these is attached to a cross head above working in guides; connecting rods from these cross heads operate crank shafts below, from which by means of spur gearing motion is given to the bearing wheels of the implement, which is thus operated. In cases where the soil is damp the machine may be mounted on a skid, and the engine then is fitted with pulleys by which it winds up ropes attached to a fixed anchor.

[*Printed*, 1*s*. 4*d*. *Drawings*.]

A.D. 1860, February 4.—No. 294.

TAYLOR, James.—(*Provisional protection only*.)—" Locomo- " tive engines and wheel carriages."

The improvements refer to traction, tram, agricultural and other engines.

1. A " hinged bar, bellied or curved downwards " is fitted by " the side of the ordinary broad tyred wheels." This bar forms

" a projecting flange at the bottom part of the wheel, when " the bar is depressed or lowered into the tram groove or by " the side of an edge rail or railway bar." A guard on the frame holds the bar in its place.

2. A " double eccentric bush " is mounted on each end of the axles. One eccentric has on it a "plain broad tyred wheel," the other a flanged wheel. "The angles at which the " two eccentric portions of the bush or ferrule are one to the " other will determine the extent to which the one is raised out " of use, whilst the other is supporting the superimposed " weight."

3. For altering the direction of motion or varying the speed double friction cones are used instead of clutches.

4. When motion is communicated to the driving wheels by means of "overhanging half cranks or stud discs and con- " necting rods," there is placed " upon the end of each driving " and each driven shaft a disc having a slot therein across its " diameter, and each projecting stud or pin is caused to travel " along the slot by means of a screw, which is acted upon or " caused to rotate whilst the engine is in motion by a tripping " piece or a curved rack being projected forward so that the " pinion or star wheel upon the screw is acted upon thereby " and the projecting stud pins are caused to move the face " of the disc."

5. Where chains are used for transmitting motion, the double cones described in No. 1387, A.D. 1856, are used.

6. To enable an engine to raise itself out of a hollow, or to ascend steep gradients, the inventor proposes to " apply struts " or legs, which are at one end attached to and work upon " stud pins projecting from the boss of each driving wheel, " or by having their ends formed as excentric straps, are " fitted to and caused to work upon excentric rings fitted " upon the boss of each driving wheel whilst the other ends " of the studs or legs are projected against the ground ; such " studs or legs may be supported by stirrups or otherwise be " held free to work back and forth, but are so arranged as to " be capable of being turned over and reversed or put out of " action when not required."

7. Instead of leaving the gearing and machinery exposed, as in No. 2548, A.D. 1858, the whole is enclosed in a casing with suitable doors, &c.

8. For the purpose of heating the feed water, and reducing the noise of the blast, a box fitted with pipes is placed in the exhaust. The feed water is made to circulate through the pipes and the waste steam inpinges on their outer surfaces.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1860, February 17.—No. 435.

BELPAIRE, ALFRED.—" Locomotive and moveable steam " engines."

The object of the invention is to construct fire boxes, &c. in such manner as to " obtain a better combustion of small " coal or slack, anthracite, peat or turf." The surface of the grate is enlarged as much as possible, its length being increased. The doors are " lined with fire-brick, and there are " small holes pierced through for the admission of air which " is regulated by a sliding plate; such fire doors are made in " two parts, the bottom edges being very nearly on a level " with the grate bars." " The doorway is also sufficiently " large to enable the fire to be fed with ease, and is provided " with suitable means of supplying or excluding air. The " upper surface of the grate bars is rather narrow and they are " placed at small distances apart." " A portion of the grate " is made to move up and down, to facilitate the removal of " clinkers," &c. The axle of one pair of bearings may be placed under the fire box, owing to its shallowness. It is suitably protected from heat.

[*Printed*, 10*d*. *Drawing*.]

A.D. 1860, April 9.—No. 891.

AVELING, THOMAS.—" Locomotive engines."

The invention is applied to locomotive or traction engines. Steering apparatus of such engines " consists simply of one or " more steering and supporting wheels carried at the lower end " of a vertical rod which is supported in a cross bar fitted to " the front end of the ordinary horse shafts." The wheels are guided by a long lever extending back to the engine and fitted with handles. The support can be removed for the attachment of horses. The steering wheels have knife edges which enter the ground.

[*Printed*, 8*d*. *Drawing*.]

A.D. 1860, May 17.—No. 1227.

CLAYTON, Nathaniel, and SHUTTLEWORTH, Joseph.—(*Provisional protection only.*)—"Portable and traction engines."

The invention "consists in suspending the boiler to the "main axle or placing the axle above the centre of the boiler. "This arrangement involves the necessity of larger travelling "wheels, which is a great advantage of locomotion, and ren-"dering the application of the power more simple and direct."

[*Printed, 4d. No Drawings.*]

A.D. 1860, May 29.—No. 1328.

PATERSON, Alexander John.—"Agricultural traction en-"gines and implements."

Sets of "lazy-tongs" are affixed to the front of a locomotive engine, and at their other ends they carry anchors. The "lazy-tongs" are alternately extended, the anchors take hold of the ground, and the engine is drawn up to them. The lazy-tongs are operated by screwed shafts with nuts travelling thereon. Each shaft has a right-hand screw on one half of its length, and a left-hand on the other half, and the nuts travelling on these screws are brought together or drawn apart by the revolution of the screws. The ends of the tongs being connected to the nuts they are extended and retracted. The screwed shafts are driven by bevel gearing, and the direction of their motion is alternated as required by clutches. The anchors are mounted on carriages, and are presumably forced into the ground by the drag backward of the engine. Ploughs, &c., mounted in suitable carriages are attached behind the engine. Or "they may be fixed to the lazy-tongs in place of "anchors." Besides the above, the following improvements are mentioned in the Provisional Specification only:—(1.) To turn the machine one of the wheels is raised off the ground by a block of wood placed under the nave and elevated by screws. "On the guide wheel being properly placed, and the "other wheel being caused to revolve, the whole machine "revolves on a socket formed in the block." (2.) An "agri-"cultural implement for turning the soil" is described.

[*Printed, 8d. Drawing.*]

A D. 1860, June 2.—No. 1358.

AUSTIN, James.—(*Provisional protection only.*)—" Traction " engines."

The boiler is upright cylindrical, and is by preference of steel or homogeneous metal plates. The interior is strengthened by vertical stays. The furnace is entirely surrounded by water, except a "circular aperture" which "serves for the " admission of the fuel, and also as an exit for the smoke and " products of combustion which pass off into a circular flue " formed outside the boiler." Vertical tubes are fitted to the boiler, and " are made with branch tubes which extend out " from the vertical tubes and return again thereto, the " branches thus forming three sides of a rectangular figure." Small curved or zig-zag tubes also connect the vertical tubes together. "The flue is formed by enclosing this arrangement " of heating tubes with an external sheet of copper." From this flue the products of combustion pass into a " spiral flue " circling round the boiler and leading to a chimney. The main axle is mounted on "pedestal bearings" sliding in brackets bolted to the boiler, and fitted with springs. They are mounted so as to serve for steering. The cylinder is horizontal and the fly wheel axis is vertical. The crank pin is "duplex, that is to say, it is bent at the part above the " connecting rod in a horizontal direction, and again verti- " cally, to which part the spindle of the slide valve motion is " attached." "The rim of the fly wheel is all on the lower " side of the wheel, and it gives motion by frictional contact " to a pinion on the upper end of a vertical shaft, the bearings " of the shaft being adjustable so that the pinion may be " regulated as regards its pressure on the rim of the fly " wheel." A worm on this shaft drives a worm wheel on the main axle " and this motion is communicated by means of " arms which are keyed thereto to pins on the naves of the " wheels." "Curved springs or prongs" on the peripheries of the wheels enter the ground to increase the hold.

[*Printed,* 4*d.* *No Drawings.*]

A.D. 1860, June 6.—No. 1386.

WENHAM, Francis Herbert.—" Steam engines."

"Steam of a high pressure is led direct from the boiler to a " cylinder of comparative small size. After having been

" there worked expansively it is returned into a series of " pipes placed in the smoke box, known as a 'superheater' " being thus surcharged with heat; it is next conveyed into " a second cylinder of large size. After being again worked " expansively it is superheated a second time by a separate " heater and passed into a third cylinder of still larger size, " and after being therein expanded to its fullest extent it is " finally discharged or exhausted into the condenser." The pistons of the three cylinders work cranks on the same shaft. In passing from one cylinder to the next, the steam may be heated, " the induction steam of the preceding thus " giving up a portion of its surplus heat for the use of the " steam going on to the next cylinder."

The second part of the invention relates to " heating steam " during its expansion in one or more cylinders; a small " quantity of very hot steam obtained from the boiler by " passing it through a coil of pipes fixed either in the chimney " flues or in proximity with the furnace is conveyed into the " cylinder during expansion or after the main working supply " of steam has been cut off." This may be effected by a separate pipe and suitable cocks or valves, or " the hot steam may be " conveyed into the space between the expansion valve and " the slide or steam valve of the engine, so that after the " expansion valve is closed, and the working supply of steam " cut off, a jet of hot steam may continue to flow into the " cylinder during the expansion to the end of the stroke."

The improvements are shown as applied to " locomotive or " agricultural engines."

[*Printed*, 8*d*. *Drawing*.]

A.D. 1860, June 29.—No. 1575.

TAYLOR, JAMES. — " Locomotive engines and wheel car- " riages."

Improvements on No. 2548, A.D. 1858.

Traction and similar engines have either three or four wheels, the smaller steering wheel or wheels being in the rear. The steersman may be on either portion of the engine. With regard to three wheeled engines the inventor says:— " I form a frame for receiving the short axle, and interpose " india-rubber or other springs therein and between the axle

" bearing sliding therein and the top of each guide or frame; " and instead of connecting or securely fixing such frame to " the inner side of a ring or kerb formed of angle iron, " working into or against another ring or kerb, by forming a " groove it is made to contain the means of constantly lubri- " cating and also of steadying the carriage." "A rack " around or partially around the periphery of the wheel plate " or steering apparatus, or fixed to the frame of the engine, " permits of sufficient power being readily applied." India-rubber springs are fitted to the driving wheels. The noise from the blast is lessened by passing the exhaust steam through a tank containing part of the feed water. Also the inventor causes "the heavy throb from the exhaust steam " produced at each stroke of the piston to be absorbed, " by coming into contact with an enlarged surface or in- " creased cubical space in an expansion box."

[*Printed*, 2*s*. 2*d*. *Drawings*.]

1860, August 18.—No. 2003.

ROMAINE, Robert.—"Machinery applicable to steam culti- " vation."

The winding apparatus may be detached from or connected to the engine. It consists "mainly of three grooved pullies " mounted at right angles to each other and driven by bevil " or other gearing. Around or over and under these pullies " the draught or traction rope is wound; it will therefore be " effectually prevented from slipping, as the whole or greater " portion of the guiding surface which it touches will be also " the driving surface." These pulleys may be arranged in various ways.

When the windlass is separate from the engine, the two are brought close together, and connected by braces. One of the engine wheels is removed, and its axle secured in a socket on the windlass frame. The drum is driven by a chain and chain wheels, with intermediate gearing, from the crank shaft. Drums are provided for coiling the rope when not in use, and there is a small drum by which the engine and windlass are hauled forward.

If the winding apparatus is attached to the engine, it may be arranged in various ways. Two of the grooved pulleys may surround the boiler, the crank shaft being mounted between them. The pulleys run on antifriction rollers. The pulleys may also be mounted below the boiler.

The bearing wheels of the engine are mounted on stud axles carried by bosses swivelling on vertical pins on the frame. By means of suitable gearing, in connexion with the steering apparatus, the wheels are brought to an angle with the frame as the steering wheel is turned. All the bearing wheels may be driven by means of "hollow spindles working " loosely on the vertical stud pins before mentioned." "The " upper ends of these hollow spindles are furnished with the " requisite clutches and pinions that gear into and drive the " large carrying wheels, and the lower portions of the hollow " spindles carry the requisite wheels or gearing that connect " them to the engine."

[*Printed*, 3*s*. *Drawings*.]

A.D. 1860, September 7.—No. 2160.

TRAVIS, Joseph Siddall.—(*Letters Patent void for want of Final Specification.*)—" Traction engines."

Two steam cylinders are used, with pistons working at a high velocity. The crank shafts can be clutched together, or work separately for moving on a curve. The crank shafts by spur gearing drive cog wheels on the bearing wheels. The circumferences of these latter are "rounded and bevelled to " suit the road." The boiler is vertical, it "is supported by " the axle of the driving wheels and by the framing, and it " is surrounded by a cistern and casing which are in communi- " cation with the supply tank; the feed water is thus heated." Safety valves are mounted on the casing. The piston rods " pass through a portion of the cistern into which water can " be admitted" if the working parts become heated. "The " valves for the steam cylinders are opened and closed by " separate regulators, but a third regulator capable of working " the valves of both cylinders simultaneously is provided. " Each steam engine is" "provided with a reversing " motion." "The chimney is furnished with a wire guard " and a hood to prevent the escape of particles of fuel and to " reduce the noise made by the steam in blowing off." The front part of the engine may be supported either on wheels or on a roller.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1860, October 5.—No. 2415.

RICKETT, THOMAS.—(*Provisional protection only.*)—" Loco-" motive engines for common roads."

The boilers are " plain cylinders throughout with flat ends." They are provided with " a flue box lined with fire bricks at " one end, and with a smoke box at the other end." " The " fire is contained in an internal circular flue, around and " above which flue are placed a series of tubes through which " the gases pass from the internal flue to the smoke box." The boilers are " short in proportion to their diameter." Below the boiler is a water tank, the working parts being placed between this and the boiler. " The power is commu-" nicated from the crank shaft to the main axle by spur " gearing giving two different speeds; one carrying wheel is " fixed upon the axle, whilst the other wheel is loose thereon " so that one or both wheels may be driven as required. The " crank shaft revolves in fixed bearings, and the main axle " revolves in pedestal bearings working between guides " placed at right angles to the crank shaft. A small wheel " placed in front is used for steering, and each wheel carries " its load through the medium of a spring."

To " avoid the noise and appearance of the escaping steam, " or to reduce the requisite supply of water," there is " a " series of chambers made of thin sheets of metal, into which " the steam enters on being discharged from the cylinders; " these chambers are constantly exposed to currents of air " caused either by the motion of the engine " or by a fan.

When additional traction power is required, a chain wheel on the engine is connected by an endless chain to a wheel on a waggon behind and this in like manner to the waggon behind it, and so on.

[*Printed, 4d. No Drawings.*]

A.D. 1860, October 24.—No. 2595.

EDDINGTON, WILLIAM, junior.—" Machinery for draining, " ploughing and cultivating land."

A steam engine is mounted on the same carriage with a pair of hauling drums. The bed plate of the engine is " at one " end connected to the carriage by a shaft or axis, and at the " other end supported by a screw " so that the engine and boiler may be kept horizontal in ascending and descending hills. The gearing is arranged so that either or both drums may be driven by the engine, and by the use of change wheels the speed may be varied. Power can also be transmitted to the running wheels of the engine, the drums being thrown out of gear. Either or both wheels may be driven at one time.

[*Printed*, 10*d*. *Drawing*.]

A,D. 1860, October 26.—No. 2618.

SYRETT, William. — "Portable, agricultural, fixed, and " marine engines."

The improvements "consist in using a non-condensing " cylinder in connection with a condensing cylinder, so " arranged that the stroke of the non-condensing cylinder " shall be longer than the stroke of the condensing cylinder, " and that the steam from the said non-condensing cylinder " shall be again used in the said condensing cylinder." In " double cylinder beam engines the non-condensing cylinder " is placed on the outside of the condensing cylinder, so " that the piston of the said non-condensing cylinder being " at a greater distance from the beam gudgeon or centre, has " a longer stroke than the piston of the said condensing " cylinder and also has to travel faster." In portable engines the cylinders are arranged in the same manner " but of course " in the portable engine the action is direct." "The " difference in the length of stroke of the respective pistons " is compensated by a corresponding difference in the length " of their cranks."

[*Printed*, 10*d*. *Drawing*.]

A.D. 1860, November 29.—No. 2931.

DARLEY, William.—(*Provisional protection only.*)—" Portable " steam engines."

" The improvements relate, first, to giving facility for the " turning of the fore wheels. For this purpose the axle of " each of the fore wheels is carried by a separate upright " shaft, and upon each of these upright shafts is fixed a " segment of teeth taken into by a screw wheel, and these " have simultaneous motion given to them in the direction

" desired from a main axis. Secondly, the improvements " have for their object means for adjusting the level of the " boiler when moving or standing on uneven ground. For " this purpose the fore end of the boiler is suspended by " screw connections from the fore axle or axles in such " manner that by turning the part of the screw connection in " one direction that end of the boiler will be raised, whilst " from the opposite direction the boiler will be lowered at " that end." It is preferred " to suspend the fore end of the " boiler by the screw connection from a spring sustained by " the fore axle or axles. By these means facility will be " given for the use of the engine, either as a traction or as a " stationary engine for agricultural purposes. When used " as a traction engine the pinions on the crank shaft will be " in gear with toothed wheels on the main wheels or their " axis, and when used as a stationary motive power engine, " the pinions on the crank shaft will be slided out of gear " with such toothed wheels, and this sliding of the pinions " separately or together " is obtained " by sliding the bearings " of the crank axle."

[*Printed, 4d. No Drawings.*]

A.D. 1860, December 1.—No. 2953.

AUSTIN, James.—" Apparatus for ploughing or cultivating " land," etc.

The first part of the invention relates to improvements on No. 72, A.D. 1858. In that specification a ploughing machine was described in which "the ploughs are arranged to " traverse by means of endless chains over frames which extend " laterally from the backward end of the engine frame." In the present invention, " only one frame with its duplex traversing " ploughs are used." On this is mounted an engine, and it is supported on broad-flanged wheels, the hinder pair of which are driven continuously by a ratchet arrangement on a screwed shaft driving a worm wheel on the axle. A strap from the fly-wheel gives motion to a pulley on a vertical shaft with a crank on it near its foot. Connecting rods from this crank act on palls one on each side of a ratchet wheel. A worm on the spindle of this wheel engages with the worm on the axle of the bearing wheels.

The second part relates to a locomotive or traction engine for use in connection with cultivating machines. The boiler is upright cylindrical, constructed of steel or homogeneous metal plates; stays three or four inches apart connect the dome of the boiler to the crown of the furnace, which is surrounded with water space; external pipes, through which the water in the boiler circulates, are covered with external flue casing. The engine cylinder is fitted horizontally on the top of the boiler inside the chimney. The piston connecting rod works on to a stud fixed in the arm of a fly-wheel which revolves horizontally on a fixed centre. The stud is cranked outside towards the centre, and carries the excentric for actuating the slide valve. The rim of the fly-wheel gives motion by frictional contact to a pulley fixed on the top of a vertical shaft; a worm on the lower end of this shaft actuates a worm wheel on the main axle, which gives motion to the wheels, the worm acting as a break when descending gradients. A circular water tank is placed upon one side of the boiler, and a fuel box on the other, and the usual accommodation for the driver is provided. " The peripheries of the driving wheels " are fitted, if required, with curved springs, or prongs, which " enter the ground as the machine is propelled along, and " so give it an increased hold." A modification is described in which an arrangement for lessening speed is made by fixing a strap pulley on the nave of the fly wheel, and another on the vertical shaft; the strap, hanging loose when not required, is brought up by means of a tightening pulley actuated by a lever, which at the same time throws the friction pulley out of contact with the fly-wheel.

[*Printed, 6d. No Drawings.*]

1861.

A.D. 1861, January 11.—No. 79.

CHELLINGWORTH, THOMAS TERTIUS, and THURLOW, JONATHAN.—(*Letters Patent void for want of Final Specification.*)—" Traction engines."

The boiler is mounted on trunnions so that it may be kept horizontal while the engine is on an incline. A pendent weighted lever is caused to put into gear apparatus which tilts the boiler to one side or the other as soon as the frame of the engine becomes inclined. This apparatus consists of a screw connected to the bottom of the boiler, having on it a bevel pinion gearing with another pinion on a shaft carrying two ratchet wheels. The weighted lever brings one or other of two palls into gear with the corresponding ratchet. The palls are mounted on a lever which is continuously vibrated by an excentric or otherwise.

A superheating chamber is set in the smoke box. It is divided by a partition reaching nearly to the bottom. The steam is admitted at the top on one side and passes down under the partition to the other side. The object is to prevent priming.

The steam from the safety valve blows off into the feed-water tank, preferably "through a coil of pipes in the " reservoir instead of at once into the reservoir."

The steering wheel is worked by a worm wheel and a segment rack with worm teeth, instead of a spur wheel and pinion.

The frame of the engine is "so formed as to give support " or bearing to the outside as well as the inside of the driving " wheels."

[*Printed*, 3*d*. *No Drawings*.]

A.D. 1861, May 4.—No. 1125.

HOMERSHAM, William Collett. — "Engines and imple- " ments for ploughing and cultivating land."

The first part of the Specification refers to agricultural engines, the improvements in which are described under the following heads :—

1. Water tanks are formed within the travelling wheels of engines, by enclosing them with convex sheet metal discs on each side, flush at their edges with the face of the rim; the delivery of water takes place into a cistern conveniently placed, through a scoop pipe within the wheel, which is in communication with the hollow axle.

2. The boiler is divided into separate sections, by placing transversely therein a number of vertical partitions extending from the bottom to near the top, to prevent whilst ascending

or descending inclines, the body of water from flowing to one or other end of the boiler, and to keep it as much as possible in equal distribution through the whole length whilst the boiler is on a slope; when on level ground the separate sections communicate by means of valves. To economise heat, the feed water is introduced at that end of the boiler which is farthest from the fire.

3. Ropes or chains covered with metal beads and running upon **V** grooved pulleys are used for transmitting motion from the crank shaft to the pinion shaft which drives the travelling wheels; also grooved pulleys fitted with sliding self-acting clips, which are made to grip and release the rope at suitable points in their revolution, are used either with or without tightening pulleys. Also ropes and chains working into pulleys with slightly serrated surfaces are used in conjunction with tightening pulleys. The remainder of the Specification describes implements for ploughing and cultivating land, also a method of joining the ends of traction ropes for steam ploughing.

[*Printed*, 10*d*. *Drawing*.]

A.D. 1861, May 14.—No. 1232.

HOWARD, James, and BOUSFIELD, Edward Tenney.—(*Letters Patent void for want of Final Specification.*)—"Ap-
" paratus to be employed in steam cultivation."

A portion of the invention relates to "the means employed
" for transmitting rotary motion from the steam engine to
" the windlass, and consists in securing the coupling rod to
" the engine shaft and the pinion shaft of the windlass by
" means of flexible couplings." These couplings may be formed "of a flexible tube of compound rubber or other
" suitable material, into the opposite ends of which the ends
" of the shafts and rod to be coupled are inserted," and
" secured by ring clamps;" or of "a flexible disc attached to
" each shaft by disc clamps at the centre and to the coupling
" rod by flat rings or flanges;" or "by attaching to the ends
" of the coupling rod and the shafts to be coupled a flexible
" steel cruciform plate, and connecting the ends of the
" adjacent plates together."

The coupling rod may be telescopic.

The rest of the invention refers to snatch blocks and tilling implements.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1861, May 18.—No. 1279.

STEVENS, BENJAMIN FRANKLIN. — (*A communication from Simon Stevens*.)—" Tractomotives or engines for running upon " earth or on common roads."

A steam engine is mounted on a frame of which one end is supported, in the manner hereafter described, on a drum, and the other on steering wheels. The engine drives small wheels running on a circular rail of bevelled or other form within the drum, and each of these wheels is kept in position by two smaller pulleys, on arms from its axle, running also on the circular rail. The water tank is placed inside the drum.

[*Printed*, 6*d*. *Drawing*.]

A.D. 1861, May 21.—No. 1295.

AVELING, THOMAS, and RAWLINSON, HENRY.—" Loco- " motive engines."

The improvements relate to agricultural locomotive engines. The cylinder is placed in the steam dome and the steam dome is set at the forward part of the engine. The objects of this arrangement are, to prevent priming on inclines, to avoid the necessity for a pipe to convey steam to the cylinder, and for a long pipe to convey the exhaust steam to the funnel, also to give ready access to the cylinder. The boiler is of wrought iron plates " from " end to end." The funnel is of cast iron. The ends and top and bottom of the water tank are of " cast flanged " plates " with wrought iron sides bolted thereto. The draw bars are of angle or T-iron and the feather of the T is chamfered off, " thus making the draw bar taper and sufficiently " elastic to act as a spring."

[*Printed*, 1*s*. 4*d*. *Drawings*.]

A.D. 1861, May 27.—No. 1331.

LEE, JOSEPH, and TAPLIN, BENJAMIN DUTTON.—" Portable " or traction steam engines."

"The traction gear consists of a pitch chain working upon " a small wrought-iron cog wheel lined with leather between " the cogs fitted on the crank shaft of the engine, and a large " cog wheel upon the hinder axle of the carriage wheel." " The axle-tree upon which the chain wheel is made fast is " fitted to the front end of the fire box part of boiler, and is " supported by two brackets which are securely fastened to " the boiler; upon the bearings of these axle-trees are fitted " two carriages which are bolted on these brackets that are " secured to the boiler. In the brackets and upon the carriages provision is made by means of slots to allow the " carriages to move backwards and forwards five or six inches " for the purpose of tightening the chain." The carriage axles "may move backwards and forwards at pleasure by " means of adjusting screws, eccentrics, or otherwise."

The front end of the boiler can be raised or lowered by means of a screw, in order to keep the boiler level on inclines.

[*Printed*, 1*s*. 6*d*. *Drawings*.]

A.D. 1861, June 4.—No. 1402.

HANCOCK, James Lamb, and HANCOCK, Frederick Lamb. —"Improvements in implements for pulverizing, ploughing, " and grubbing land, and in applying motive power for " working agricultural implements."

One part of the invention consists "in the employment of a " portable engine set upon wheels, furnished with a reservoir " for containing compressed air or gas, which is forced into " the said reservoir through pipes, tubes, or mains from a " stationary engine; or, instead of the reservoir containing " air or gas, it may be used as a vacuum chamber, and the " stationary engine may be made to exhaust the same, when " the portable engine will be worked as a vacuum engine." A diagram on one sheet of the drawings shows the application of this arrangement to a farm, a main pipe being laid down over the farm, with supply taps in each field. One stationary engine thus serves the whole farm. The invention also consists in providing "the stationary engine for transmitting the " power to the portable engine with two or more condensers " to each cylinder, and one or more air pumps. The pump is

" made to act through different tubes upon each condenser " alternately, the cylinder being in connection alternately " with the condensers;" and there is "an escape for a part " of the steam, after doing duty from the cylinder, into a " chamber or into the open air before passage is opened into " the condensers."

Another head consists in regulating the speed of the winding drums of portable engines "by means of clutch " connections." The drawing shows an ordinary arrangement of a sliding shaft with spur wheels of different sizes gearing with corresponding spur wheels on the drum spindle so as to give two speeds to the drum. The rest of the Specification refers to "implements for pulverizing, ploughing, and " grubbing land."

[*Printed*, 1*s*. 4*d*. *Drawings*.]

A.D. 1861, June 10.—No. 1483.

ROMAINE, Robert.—"Machinery applicable to steam culti- " vation."

Improvements on No. 1229, A.D. 1859 and No. 2003, A.D. 1860.

The grooved pulleys employed as winding drums have on each a spur wheel, and they are driven by "spur pinions fast " on the ends of two short shafts which carry on their inner " ends two bevil wheels gearing into two similar wheels loose " on a shaft which is mounted at right angles to the shaft " carrying the grooved pulleys. Fitted to this cross shaft are " two friction clutches immediately alongside the last men- " tioned bevil wheels, their use being to start, stop, or reverse " the action of the winding apparatus without stopping or " reversing the action of the steam engine." When the winding apparatus is mounted on the engine the groove pulleys travel on rollers round the shell of the boiler, "three " bevil wheels only are used, and the clutch shaft is driven " direct from the crank shaft of the engine by means of spur " gearing."

In the "double drum windlass" a similar arrangement to the above is employed, and a "self-acting coiling apparatus" is connected to each drum. The inventor says:—"In " carrying out the self-coiling improvement I employ for

" each drum either a long pinion or a short double flanged " one, for imparting rotary motion to the drums, and cause " the drums to travel to and fro on their own shaft in order " to coil up or uncoil any given length of traction rope."

The winding apparatus may be mounted on a wheeled platform, on to which a portable engine can be run when required.

[*Printed*, 3*s*. *Drawings*.]

A.D. 1861, June 14.—No. 1533.

LEACH, George.—" Agricultural implements and engines."

The first portion of the invention refers to a cultivator.

The second part of the invention relates to upright boilers for traction engines. The form is rectangular, with a shallow water space at bottom and combined water and steam chamber at top; the sides are encased to form water heating reservoirs, and thin water spaces form the back and front; the whole of the interior, excepting the furnace space, is filled with vertical water tubes set into tube plates, which constitute the bottom plate of the upper water space and steam chamber, and the top plate of the lower water space. The furnace is fed downwards by means of an opening formed through the steam chamber; baffle plates of fire-brick or metal are placed amongst the tubes, in order so to change the direction of the flaming gases, that they may more effectually play amongst the tubes; the position of these plates may be altered at pleasure; the exhaust steam is blown off up the chimney, which is oblong in plan, divided into compartments. The waste steam can be allowed to pass through one or more, or all these compartments to "diminish the noise, and thus not " frighten horses when travelling on the high roads." The engine cylinders are placed at the sides of the boiler; their connecting rods are coupled to a crank shaft, which by means of a pinion gives motion to a spur wheel and counter shaft, wherefrom by the aid of chain wheels and chains the driving wheels and "steam mole" are set in motion. The engine is to be used either in connection with the cultivator, or separately as a traction engine.

[*Printed*, 1*s*. 4*d*. *Drawings*.]

A.D. 1861, June 18.—No. 1569.

KIRBY, JOSEPH EDWARD.—(*Provisional protection only.*)—" Steam engines and machinery for giving motion to agricul-" tural implements."

1. The rod of the slide valve is connected to a slide on a rocking lever which receives a uniform motion from the crank shaft. The position of the slide on the lever is regulated by an ordinary governor which thus controls the action of the slide valve.

2. A pair of winding drums are mounted on a shaft on which also is a pair of running wheels. The frame is connected to the frame of a portable engine. The shaft receives its motion preferably by two or more wire ropes running over pulleys with corresponding grooves. On the ends of the drums are projections which give motion to a screw shaft or other appliance " by which a nut or instrument by means of a " finger or projection guides the wire rope as it is coiled on " the cylinder."

[*Printed, 4d. No Drawings.*]

A.D. 1861, July 3.—No. 1688.

SIMONTON, JOHN.—(*Provisional protection only.*)—" Traction " engines," &c.

1. An " endless railway or platform placed below the frame " of the engine," which " consists of rails, wheels, and " sleepers, arranged in an inverted order from that of an " ordinary railway, the rails being fixed to the frame of the " engines, run over and upon the wheels while the wheels are " connected to and supported by the cross bars or sleepers; " the sleepers are jointed or hinged together in the form of " an endless band or chain, & which constitutes the moving " platform." The engine is to be used to drag after it agricultural implements. " Turning round can be provided " for by having three running wheels, which can be pressed " downwards towards the earth by screws actuated by the " engine or otherwise, thus lifting the engine and railway " free of the ground altogether; then by driving one side " wheel by chain, band, or other means, the engine will " swing round; it may also be steered by analogous means."

2. To prevent priming the boiler is suspended from a "centre of oscillation above it," so that it may always hang horizontally. The steam pipe passes through the gudgeons; the feed pipes are jointed.

[*Printed, 4d. No Drawnigs.*]

A.D. 1861, July 10.—No. 1744.

CHELLINGWORTH, Thomas Tertius, and **THURLOW**, Jonathan.—"Traction engines."

The frame is formed of plate iron set edgeways in four parallel lines with three spaces between. The boiler is in the central space, and the driving wheels in the narrower side spaces. The cylinders are placed on an incline, partly in the side spaces over the wheels. The boiler is supported by side trunnions fixed near the fire-box end on bearings fixed to the frame, the smoke-box end resting on a vertical screw by which it can be raised or lowered to preserve the level of the water on inclines. Both ends of the cylinders are fitted with stuffing boxes; the feed pump is disposed in a line behind one cylinder and the tank pump behind the other, the plungers being fixed on their respective piston rods and thus worked direct. The boiler feed pipe is composed of plug and socket pieces and connecting bands which adjust themselves according to the changing position of the boiler through which the exhaust steam is taken on its passage to the chimney in order that it "may be desiccated and pass off in the form of "vapour." A superheating chamber with tubular passages is arranged in the smoke box. The fore carriage is supported on steering wheels, which are operated by suitable gearing. The driving wheels are formed in two parts, each with a separate nave and set of spokes and felloes welded together. The two parts are fitted and bolted with wood packing between their felloes within a surrounding ring, around which, between it and the tire, is a packing of india-rubber. Jointed to the strap of an eccentric which is fixed between the naves there are a number of radiating rods which give radial motion to a set of "spades," and cause them to slide through openings in the tire and project therefrom. The wheels are driven from a pinion on the engine shaft gearing with an internal spur wheel on the driving wheel. A friction strap on the plain surface of the internal toothed wheel serves to check the speed of the engine or stop it.

Shear legs may be fitted on the frame, and the engine used to drive a winding drum mounted on the frame, so that it may serve as a steam crane. The drum may also be employed for "driving machinery."

[*Printed*, 4*s*. 8*d*. *Drawings*.]

A.D. 1861, July 19.—No. 1821.

SAVORY, William, and SAVORY, Paul Haines.—"Winding apparatus."

The drum or drums surround the boiler of the engine, running on friction wheels thereon. A pinion driven from the engine gears with a ring of teeth within the drum. To guide the rope on the drum a frame traverses along a screw shaft across the drum. On this frame are two pair of pulleys, one vertical and one horizontal, the latter being grooved. The rope passes between these pulleys, and is laid on the drum by the movement of the frame.

[*Printed*, 10*d*. *Drawing*.]

A.D. 1861, September 14.—No. 2296.

HAWKSLEY, George.—(*Provisional protection only*.)—"Traction and locomotive engines."

To enable such engines to pass round curves the driving wheels are actuated in the following manner:—"The two " driving wheels of a traction or locomotive engine are fixed " on separate axes, and the ends of these axes are received " into and freely turn within the nave of a toothed wheel. " On the axis of each driving wheel is a bevelled toothed " wheel, these bevelled wheels gear into the opposite sides of " one or more, and by preference more than one, bevelled " toothed wheel, the axes of which are carried by the toothed " wheel into the nave of which the ends of the two axes of " the two driving wheels pass. Motion is given to this " toothed wheel by means of a cog wheel or pinion, on an axis " driven by the engine. By these means, so long as it is " desired that the traction or locomotive engine shall be " propelled in a straight line, the two driving wheels will be " actuated by the bevil wheels equally, but when it is

" desired that the traction or locomotive engine should turn, " then the driving wheel, which for the time being will " perform in the outer or larger curve, will be turned more " quickly than the other driving wheel which is to perform " in the inner or smaller curve. It is not essential that the " bevilled toothed wheels should be on the axes of the driving " wheels, as the driving wheels may be driven by pinions " acting in toothed wheels fixed to the driving wheels, and " the axes of the pinions may then receive motion in a " similar manner to that above described in respect to the " axes of the driving wheels, in which case it will be desirable " that the pinion axes should be hollow, and they and the " cog or toothed wheel which carries the bevelled toothed " wheel or wheels turn on a fixed shaft or axis."

[*Printed, 4d. No Drawings.*]

A.D. 1861, September 17.—No. 2321.

LEE, JOSEPH, and TAPLIN, BENJAMIN DUTTON.—" Traction " engines."

"An ordinary locomotive boiler is employed; the fire- " box forms the fore end, before which supported by the " front wheels there is a platform, whereon the driver and " steersman stand. The axle of the hind or driving wheels " is below the cylindrical part of the boiler, and the crank " shaft which is driven by a pair of cylinders contained in " the upper part of the smoke box is placed above the boiler " directly over the axle. On one end of the crank shaft there " are two loose pinions of different diameters which when " desired can be made fast respectively by means of a peculiar " form of clutch, operated by the driver. On the axle of the " driving wheels are two spur wheels of suitable diameters, " gearing into the two different sized pinions, whereby " differential speeds for the driving wheels are obtained. The " leading wheels turn on pins or short arms projecting " laterally from vertical axes, supported in suitable bearings " attached to the end of a cross bar, and by means of lever " arms and connecting rods are simultaneously directed by " the guiding apparatus in the desired direction. A screw " passes vertically through the centre of the cross bar, " whereby the end of the boiler may be raised or depressed

" so as to maintain a horizontal position whilst ascending and
" descending inclines. The usual appliances of safety valve
" and gauges are compressed in the general arrangement."

[*Printed,* 1*s*. 6*d*. *Drawings.*]

A.D. 1861, October 15.—No. 2568.

GILBERT, John.—" Endless railways."

The endless railways are to be applied to common road carriages available for heavy traffic, and also for use in ploughing. Each wheel is fitted with an endless railway carried round it over a pair of pulleys, one before and one behind the wheel. The railway is composed of a steel band or chain carrying lengths of rail. The wheels over which the railway works are flanged and may have india-rubber tyres. The rails may be fitted with racks into which a spur wheel on the bearing wheel gears. The steel band carrying the lengths of rail may be supported by jointed radial arms from the axle of the running wheels, or the pulleys may be smaller and may have a band surrounding them, to which arms are jointed, the other ends of these arms serving to support the endless railway.

[*Printed,* 1*s*. 4*d*. *Drawings.*]

A.D. 1861, October 23.—No. 2647.

WILSON, John William. — (*Provisional protection only.*) —
" Improvements in machinery for digging and cultivating
" the soil and in steam engines."

The first part of the Provisional Specification refers to a rotary cultivating apparatus. The rest of it runs as follows :—

" My improvements in steam engines for agricultural pur-
" poses consist in mounting the bearing wheels on bushes
" through which the crank shaft works. The leading or
" guiding wheels are acted upon by a steering apparatus
" consisting of a worm and worm wheel and a pinion and
" sector or other equivalent arrangement of parts. The speed
" of the engine is reduced to suit the speed of the bearing
" wheels by a counter shaft which is driven from the crank
" shaft by pulleys and chains or by gearing, and the counter
" shaft is provided with a set of differential wheels for

" equalising the action of the chains or gearing in going " round curves. When the above improvements are com- " bined, the strap with the spades and picks is turned round " from the crank shaft of the steam engine by a chain or " chains and pulleys or by toothed gearing, or by other " suitable means. The improved steam engine may be " employed for any other agricultural purposes."

[*Printed, 4d. No Drawings.*]

A.D. 1861, October 23.—No. 2655.

MARSHALL, JOHN.—(*Provisional protection only.*)—"Traction engines," &c.

The driving pinion which gears into the driving wheel is placed " forward of the axes of the driving wheels." It slides in vertical guides. The axles of the driving wheels also slide in guides curved in a circle with radius equal to the distance of the pinion from the axle. The object of this it is stated is that the weight of the engine may act on the driving wheel and assist it to revolve.

2. In carriages drawn by the engine motion is given from the engine to the carriage wheels by a shaft and spur gearing.

3. In wheels for traction engines, &c., there is " within the " rim or felloe of the wheel a raised rail." A frame "within " " the wheel " and bolted to the axle, has two arms carrying grooved wheels which run on the rail. By this arrangement " a portion of the weight is (by the forward pull in drawing " the carriage) thrown in advance of the line of direct pres- " sure of the wheel upon the ground."

[*Printed, 4d. No Drawings.*]

A.D. 1861, November 2.—No. 2753.

YARROW, ALFRED FERNANDEZ, and HILDITCH, JAMES BRACEBRIDGE.—"Machinery used when ploughing, tilling, or " cultivating land by steam power."

1. Two winding drums are mounted on a horizontal shaft at the side of a portable engine. Bevel teeth on one end of each drum gear with bevel wheels on an inclined shaft driven from the engine. The drums are moveable in the direction of their axis to bring them into gear alternately.

2. On a similar horizontal shaft is keyed a large bevel wheel, and there is "a barrel or drum upon each side of this wheel, " to which they may be alternately connected." The large wheel is driven from the engine shaft. A second bevel wheel on the same shaft can be thrown in and out of gear with a wheel which gives motion to the driving wheels to propel the engine.

3. The drums are connected to the shaft by a clutch, by means of which they are driven alternately.

[*Printed*, 10*d*. *Drawing*.]

A.D. 1861, November 19.—No. 2904.

LEE, JESSE.—(*Provisional protection only.*)—" Improvements
" in the construction of the wheels of traction engines and in
" the mode of adaptation to such engines."

"This invention consists, first, in adapting transverse bars
" of metal to the felloes of the wheels of traction engines to
" ensure greater hold of said wheels in the ground than
" heretofore; secondly, in connecting together at will two of
" such said wheels placed at opposite sides of the engine, or
" only conecting one of said wheels with the spur wheel of
" the engine so as to be driven thereby; this may be effected
" by placing each wheel loosely upon the axle on which the
" aforesaid spur wheel is fixed, and by means of a lever wheel
" and clutch box fixing one or both of said wheels on the
" axle, or releasing therefrom as desired; thirdly, in adapting
" a broad wheel to the fire-box end of the boiler of a traction
" engine, said wheel being constructed of two narrow felloes
" connected together by transverse bars or plates of metal;
" this wheel is mounted loosely upon an axle on which is
" fixed a spur wheel driven by the engine, a lever wheel and
" clutch is also employed for fixing said wheel on the axle so
" as to be moved thereby as desired, or instead of con-
" structing the aforesaid broad wheel as lastly above described
" it may be formed of two hollow cylinders, around which are
" formed projections; these cylinders may either be coupled
" together or separately with the driving spur wheel before
" mentioned or be entirely freed therefrom by means of a
" lever handle and clutch as before described with reference
" to the second part of this invention."

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1861, November 23.—No. 2948.

BRAY, WILLIAM. — "Locomotive apparatus particularly " adapted to agricultural purposes."

Various improvements in agricultural engines are described. One or two boilers and one or two steam engine cylinders are supported on the framing over the main axle, which thereby sustains the principal part of the weight; the machinery is mounted on a plate pivoted on a "locking plate" which carries the bearing wheels. The main axle consists of two parts, which project respectively from the ends of a central double socket piece, made tubular at both ends, to receive the axles which project and carry the wheels and the spur gearing, whereby the wheels can, either together or separately, be set in motion. Motion is communicated from the engine to toothed "rim wheels" which are either bolted to the bearing wheels or drive them by means of a "driver" or peg fixed to the spur-wheel and acting against one of the spokes of the bearing wheel. The ends of the axles, whereon the wheels revolve, are cranked so that the centres of revolution are eccentric to the centre of the axle; by means of this contrivance one driving wheel may be adjusted to revolve in advance of the other, or by bringing the eccentricity of either wheel below the centre, the wheels may be adjusted to run on different levels without effecting the horizontal level of the machine. The arrangement above described allows motion to be communicated to the bearing wheels, whatever be their relative position. The axles of the main wheels may pass through hollow axles on which spur wheels run. The steering is managed by operating on the driving wheels by means of a pinion engaging with a segmental rack formed on the ends of the "locking plate." Two boilers are preferred, one on each side of the axle; the engines may be similarly arranged. "Connected to each end " of the engine, for agricultural purposes, is a frame (firmly " bolted or hinged to an under locking frame of the engine); " this frame is supported at each end by a small pivot wheel or " by a supporting wheel which will run in the last furrow," or on the unploughed land. The frame may be oblong or triangular." It is "slotted at each end, in which slots " several movable beams are placed longitudinally, in order " to carry any implements for tilling," etc. These are fixed as required by screws, etc., and raised or lowered by a rack and pinion, etc. either together or separately, one set being in use, while the other set are raised from the ground. The frame may also be jointed, and raised by a chain and pulley. Above the frame is a platform for the attendant. In the drawing only one such frame is shown, attached behind an engine, and it appears to be fitted with only a single set of cultivating tools. When not required for tilling operations, a wagon body capable of carrying farm produce, coals, or manure, may be placed upon the frame, and the engine be employed for removing them as well as for thrashing, grinding, pumping, etc. Reference is made to No. 3102, A.D. 1856.

[*Printed*, 8*d*. *Drawing*.]

A.D. 1861, December 4.—No. 3045.

PULLAN, Abraham, and LAKE, William.—(*Provisional protection only.*)—" Improvements in traction and other engines, " and in wheels for traction engines and other carriages, and " in giving motion to ploughs and other agricultural machines."

The following are the numerous matters with which the Provisional Specification deals :—

1. The use of a stud and socket to prevent the vibrations of the driving wheels being communicated to the other parts of the engine.

2. Keeping the pinions of the driving shaft in gear with the driving wheels by means of adjustable springs.

3. " Where springs are used to the traction engines with " chains or ropes," the shafts are kept parallel with each other by means of frames or links tied together by transverse braces. When required the chains or ropes are tightened by the use of screws and sockets.

4. Fitting an auxiliary bearing wheel to engines constructed according to the description given in the Specification of No. 1670, A.D. 1859. This auxiliary wheel is for the purpose of increasing the bearing surface; it is mounted on a collar which embraces the main axle; the surface of its periphery may be either plain or furnished with transverse projections for holding to the land. When required it is brought into or thrown out of action by means of a screw.

5. In order to prevent the slipping of driving wheels, they are furnished with pins or teeth which are projected through

their peripheries by means of springs which yield when acting against stone or hard surface. Grippers and teeth are also employed for the same purpose.

6. Supplemental removable rails or shoes united by links are used in connection with the bearing wheels. The invention extends to various other details including gear with chain and ropes for hoisting and other purposes.

7. "Teeth on axes, and moving on the side surfaces of "driving wheels" are used. These teeth are linked together and worked from an eccentric on the driving shaft.

8. Communicating motion to the driving wheels of traction engines by endless bands over "clip sheaves."

9. Using wire ropes with projections formed thereon. The purpose for which such ropes are to be used is not stated.

10. Communicating motion to the wheels of traction engines by "common cable chains" and wheels suitably formed. The engine has different speeds, for which purpose clutches and suitable pinions are arranged. To take up the slack of driving bands an "eccentric tube" fits over the axle of the driving wheels, and by moving this in its bearings the driving wheels are shifted. The driving wheels may be driven at different speed by using two sets of spur wheels capable of being geared independently with each wheel. When "for thrashing "or other work" only one cylinder is required, the crank shaft may be made "in two parts."

11. The tubes of boilers are smallest at their "necks or "junctions with their end plates." To prevent the roof of the fire-box being uncovered in descending inclines the inventors "carry the upper part of the tubes above the "roof." Or "the upper parts of the tubes may open into "separate chambers, and these chambers may also serve as "stays for the top of the fire-box." "The outer surface of "the tubes or of the outer row of tubes is coated and filled "in with fire-clay."

12. 13. Hoisting apparatus.

14. Mode of causing the piston rod of the engine to act also as the connecting rod. By means of a joint the rod is attached to the piston, and the vibrations of the rod provided for by fitting a curved slide (which carries the stuffing box) to the cylinder cover.

15. Rotary engines for traction and other purposes are made with "the piston of a curved figure fitting into a curved "form of cylinder."

16. In rotary engines "in which the piston travels in an "annular space," "forming the bar or radial rod connecting "the piston to the axis with a ring moving in packing "adapted to keep the passage in the annular space in which "the radial rod or bar traverses is closed."

17. The piston rod of a traction engine is connected to "the "piston rod of another cylinder for pumping."

18. Giving motion to the wheels of ploughs and implements by means of the traction ropes.

19. So arranging the fore carriage of the engine that the axle of the steering wheels has liberty to vibrate and accommodate itself to inequalities of the road.

[*Printed, 4d. No Drawings.*]

A.D. 1861, December 21.—No. 3211.

SELBY, Fraser.—Steam boilers, engines, &c.

One part of the invention "relates to the transmission of "motion from the crank axle to the driving axle, where gear-"ing is used specially applicable to paddle wheel steamers, "traction and locomotive engines. The driving axle being "much subject to vibration is made into two shafts," and the inner ends are hung "on swivel or ball bearings"; "the geared "wheels hang over the centre of these bearings, and being "geared into a pinion or wheel on the crank axle can never "get out of gear or cross the teeth, one fitting into the other, "the face of the wheels being convex and concave according "to the radius taken from the swivel bearings, and the "diameter of the wheels. The other ends of these half shafts "are fixed as is usual, and kept in their places by springs."

[*Printed, 2s. 2d. Drawings.*]

1862.

A.D. 1862, January 17.—No. 129.

ROMAINE, Robert.—Apparatus for steam cultivation.

1. Apparatus for guiding, regulating the tension of, taking up the slack of, &c., traction ropes used in steam ploughing.

2. Improvements on No. 2003, A.D. 1860, and No. 1483, A.D. 1861. Winding apparatus in which "three V-shaped "grooved sheaves" are used. Instead of these sheaves being set on horizontal axes they are geared together and set "alongside the steam engine on vertical axes." "The "sheaves are driven by a spur pinion connected by a vertical "shaft and bevel gearing to the crank shaft of the engine, or "the connection may be made by means of a pitch chain or "bolt."

3. Steam ploughs.

4. Anchors.

5. Improvements in the fire-boxes of horizontal tubular boilers used for agricultural and traction engines. The object is to prevent the crown plate becoming uncovered on an incline. In place of the crown plate, a "fire-brick diaphragm "or roof" is "placed a little below the water line." "The "fire bricks are fastened to a metal frame which is suspended "from angle iron pieces attached to the internal fire-box or "by bolts from the top of fire-box, thereby compelling the "gases to pass through the tubes. The plates of the internal "fire-box are carried up vertically, the narrow water or steam "spaces being continued to the top where they are rivetted "to the external fire-box, and finished in the same manner "that the bottoms of fire-boxes usually are. The space "above the fire-brick roof or diaphragm is occupied by a "steam reservoir or dome, which is divided into two compartments, in order that steam may be drawn from either end "or each alternately."

[*Printed*, 3*s*. 6*d*. *Drawings*.]

A.D. 1862, January 24.—No. 191.

ALISON, John.—"Apparatus for tilling land by steam power."

The winding drums of portable steam engines are mounted on horizontal shafts in frames pivoted to the engine. By means of a rack and a worm worked by a handle, the drum can be shifted as required. It is driven by bevel gearing so arranged that the movement of the drum does not throw it out of gear. By preference a flat steel band is used instead of a traction rope, the drum being formed to fit it. Two engines on opposite headlands each with one drum, or one engine with two drums may be used.

The engines are moved by a drum winding on a rope anchored ahead. This drum is thrown in and out of gear as required.

[*Printed,* 1*s.* 10*d.* *Drawings.*]

A.D. 1862, February 5.—No. 307.

LEE, Jesse. — (*Provisional protection only.*) — " Traction " engines."

" This invention consists in placing the axle on which the " traction wheels of the engine are mounted about the centre of " the length of the boiler, so that said boiler may be balanced " across said axle, and one end of the boiler be raised or " lowered by a lever when going down or up hill, for the " purpose of keeping the boiler as near as may be level at " such times."

[*Printed,* 4*d.* *No Drawings.*]

A.D. 1862, February 13.—No. 377.

PETERS, John. — (*Provisional protection only.*)—" Portable " steam engines, applicable to locomotive, stationary and " marine engines."

" The steam cylinder is constructed on the oscillating principle, " and is placed within the steam dome of the boilers. The " bearings of the trunnions are fixed on the top of the boiler, " and the inlet and exhaust passages as in all cylinders of this " construction, are made in the trunnions, one of which is " provided with an exhaust pipe and a valve whereby the " action of the engine may be reversed when required. The " piston rod is connected to a crank on the end of the crank-" shaft which works in a steam-tight stuffing-box secured " to or fixed on the side of the steam dome. This bearing " may be made long enough to support the crank shaft with-" out further assistance, or the outer end of the shaft may, if

" desired, be supported in another bearing on a standard
" secured to the side of the boiler or some other convenient
" part of the apparatus. The crank shaft carries a band
" wheel or driving pulley, whereby motion may be transmitted
" to any machinery that requires to be driven. A force pump
" for supplying the boiler with water is also mounted on one
" side of the boiler, and the piston of this pump is worked by
" an eccentric on the crank shaft."

[*Printed, 4d. No Drawings.*]

A.D. 1862, March 7.—No. 612.

FOWLER, John, junior, GREIG, David, and NODDINGS, Richard.—" Apparatus for cultivating or tilling land."

The invention relates to implements used in steam cultivation, and to the winding apparatus of agricultural engines. Two sets of improvements in the latter are described.

1. When the drum turns on a vertical axis the guiding apparatus is so arranged " that it can take any position around " the hauling drum which the angle of the rope may for the " time require." The arrangement is not described in the body of the Specification, but a description is given on the margin of one of the drawings. The drum is fitted with internal cogs, and is driven by a pinion on a vertical shaft actuated by the engine. A pinion fixed on the face of the drum is carried round thereby and gears with a fixed wheel concentric with the drum; it also gears with a pinion on a cam-grooved wheel, also concentric with the drum. The numbers of the teeth are so arranged that for each revolution of the drum the cam wheel is moved one tooth. The coiling lever, carrying the roller frame which lays the rope on the drum, has a stud thereon which takes into the groove of the cam wheel, and is thus raised and lowered as the drum revolves.

2. The drums are mounted so that they can swing round and adjust themselves to the line of the traction rope. This arrangement, like (1), is only described on the margin of one of the drawings. The drum is mounted in a swinging frame carried by brackets fixed on the top and the underside of the boiler, and bevel gearing is so arranged that the drum can swing from side to side without throwing the pinions out of

gear. The drum is driven by a pinion engaging with a spur wheel on its periphery.

3. The boiler, engines and drum are arranged so that they can "turn partially round on their carriage frame so as to "adjust the plane of the drum to the line of draught." The engine has a drum on either side; it is mounted in the centre of a frame on which it is supported by four arms with friction rollers running on guides on the frame. It can be moved by a rack and pinion or otherwise.

[*Printed*, 2*s*. *Drawings*.]

A.D. 1862, March 10.—No. 646.

BARCLAY, ANDREW.—Traction engines and pressure gauges.

1. The engine runs on two large driving wheels in front, and a trailing wheel behind. Each driving wheel is driven from a separate pair of engines. The wheels are set so that there is room for the cylinders, &c., between the wheels and the framing. Motion is communicated from the crank shafts to the driving wheels by pinions and internal spur wheels on the driving wheels. The engine is steered by cutting off the steam from one or other pair of cylinders, and this is arranged to be done by a single handle which is turned to one side or the other to cut off the steam from either pair. Also the driving wheels may be keyed each on a boss running loose on the main axle, and carrying a spur wheel engaging with the pinion on the crank shaft. The peripheries of the wheels are formed with hexagonal or other shaped recesses, in which are fitted projecting wooden plugs. The object of this is to deaden the noise of the wheels. The funnel has an "external casing" like "the spark arresters used in the American locomotives." The object of this is to lessen the noise of the exhaust steam.

2. A modification of the above is described. The engine rests on two wheels only, and is supported behind by a "T-"shaped connecting piece" which secures it to the carriage, &c., drawn by the engine. The boiler is vertical tubular. "Within the smoke box is arranged a series of four or other "number of equidistant tubes, which serve to superheat the "steam." The engine is steered in a similar way to (1.) The steering may also be effected by applying breaks to pulleys on the crank shafts. The driving wheels have two spur wheels, so that their speed may be varied.

3. The pressure gauge consists of a thin disc of steel with india-rubber backing, fitted in a suitable case. The pressure of the steam on the disc is transmitted by levers to an index handle.

[*Printed*, 2*s*. 2*d*. *Drawing*.]

A.D. 1862, April 3.—No. 947.

LEE, Joseph.—(*Provisional protection only.*)—"Traction en" gines, and boilers for traction, locomotive, and other " purposes."

"The improvements in traction engines consist in giving " motion to the main or driving pair of wheels by a pinion " on the crank shaft of the engine, gearing into an inter" mediate wheel, on the axis of which is another smaller wheel, " which gears into a toothed wheel on the axis of the main or " driving wheels. The intermediate wheels turn on a stud " which projects from the bracket which carries the crank " shaft; this stud, the crank shaft, and the axis of the main " wheels are so placed that their centres are all in one vertical " line." The improvements in boilers consist in constructing them " so that the horizontal tubes which pass from the fire" box conduct the products of combustion into a smoke-box or " chamber, from the top of which they pass away through " vertical tubes which rise up through the dome or steam " chamber of the boiler, and on the exterior of the dome the " tubes open into a chimney, which can be turned down when " the tubes require cleaning. The smoke-box or chamber " above mentioned is formed by the plate which receives the " ends of the horizontal tubes from the fire-box being bent at " right angles, the portion bent down at right angles receiving " the vertical tubes which rise up through the dome."

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1862, May 3.—No 1318.

FOWLER, John.—" Engines for hauling agricultural imple" ments."

This invention has for its object the so constructing a portable steam engine with compound winding apparatus, that it may be used for hauling ploughs and implements requiring ordinary draught, or drain ploughs and such other implements as require a very heavy draught. The engine is of the ordinary construction, consisting of two horizontal cylinders superposed on the firebox of a horizontal boiler, which is mounted upon a carriage on four wheels, the two main wheels being loose upon the main axle, and the fore wheels on an axle attached to a fore carriage. Underneath the boiler between the fore and hind wheels two drums are mounted on vertical axes, and so driven by gearing properly proportioned and connected with the engine, that one drum will only revolve once whilst the other revolves several times. It is preferred upon the fast running drum to have nipping instruments whereby to hold a rope passing partly round it. The slow running drum is preferred to wind on or coil up the rope, but it may also be made a strong nipping drum. In place of mounting both drums permanently, arrangements are made for the removal of the faster drum and a second slow drum is to be substituted and connected by suitable gear, the engine framing being arranged accordingly.

[*Printed,* 10*d.* *Drawing.*]

A.D. 1862, May 19.—No. 1514.

LEE, Jesse.—(*Provisional protection only.*)—" Construction of " traction engines."

" This invention relates first to the wheels of traction engines; " secondly to the balancing of the boiler; and thirdly to the " supporting of the intermediate wheel which connects the " spur wheel with the pinion on the fly wheel shaft."

1. " Adapting transverse bars of metal to the felloes of the " wheels to ensure greater hold of the said wheels on the " ground than heretofore, so as to prevent the slipping round " of said wheels;" and " connecting together at will two of " such said wheels by plates extending from the felloes of one " wheel to the felloes of the other and opposite wheels so as to " enable said wheels to be worked in a similar manner to a " roller."

2. The inventor proposes " to balance the boiler across the " axle and to elevate and lower same as may be desired by " means of a lever worked either by hand or by a screw " from the firebox end of the engine."

3. The "intermediate wheel which connects the spur wheel "with the pinion on the fly wheel shaft" is supported by links "attached to the axle tree and fly-wheel shaft."

[*Printed, 4d. No Drawings.*]

A.D. 1862, May 31.—No. 1638.

HOLLAND, John Henry.—(*Provisional protection only.*)—"Traction engines."

The invention consists in covering such engines with "roofs and sides, of such a nature as to assimilate them in "external appearance to modern omnibuses or railway cars."

[*Printed, 4d. No Drawings.*]

A.D. 1862, June 6.—No. 1705.

DEATH, Ephraim.—(*Provisional protection only.*)—"Road "locomotives or traction engines."

1. The engine is fixed on a bed plate connected to square plates on the ends of the boiler instead of to the shell of the boiler. This is to prevent the bearings, &c. being affected by the expansion of the boiler, and to allow of the engine being readily disconnected.

2. The axle is mounted in two side plates carried by the end plates above mentioned. This is to prevent its being heated by contact with the boiler.

3. The axle is formed "with journals working in bearings "between the side plates and the wheels, which bearings are "fixed to a frame extending the whole length of the engine." These journals "form two pivots on which the hinder part of "the frame rests when the front end of the boiler is raised or "lowered by means of a screw" or otherwise.

4. "Applying the power for turning a single steering wheel "at or near to the axle instead of above the top of the "wheel." "For this purpose a flanged ring is fixed to the "side frames forming a fore carriage, another moveable ring "having a face working against that of the fixed ring, such "moveable ring having also teeth on a portion of its outer "circumference gearing with the ordinary pinion for turning "the wheel." Brackets on the moveable ring carry "sliding "blocks which serve as bearings for the axle."

5. The engine frame is of tubes for carrying water.

6. "Two distinct engines with two fly wheels" are used either together or separately.

[*Printed, 4d. No Drawings.*]

A.D. 1862, September 9.—No. 2480.

SELBY, FRASER.—"Improvements in traction engines and in "valves for traction engines when compound engines are "used."

To prevent jolting the axle of the driving wheels is made in three parts connected by Hook's joints, or other suitable joints. The middle, which is the shortest length, carries the spur wheel, which is thus unaffected by the movements of the wheels. The cylinders are placed side by side under the smoke box; the crank shaft is very short and is supported by brackets under the boiler. The improvements in valves are available for any compound engine, and are shown and described as applied to a stationary engine consisting in one place of a high-pressure cylinder placed concentrically inside a low-pressure cylinder, and in another place of two such cylinders placed side by side. There are three separate valves and valve boxes; the first regulates the admission and emission of the high-pressure steam to and from that cylinder; this valve seating has four ports, two leading respectively to the ends of the high-pressure cylinder, and two to the other steam boxes which regulate the admission and emission of steam to and from the low-pressure cylinder. Each of these two steam boxes contains an ordinary slide valve; one rod may work both valves when placed in a line, passing through a stuffing box in the partition between the valve boxes; one port in each box communicates respectively with the separate ends of the cylinder, and the other ports with the exhaust or with the condension. Another arrangement consists in working two slide valves in the same steam chest, one valve on the back of the other; the valve seating is pierced with five ports, two of which work the piston in the high-pressure cylinder, and two the piston in the low-pressure cylinder, the fifth port being the passage for the exhaust.

[*Printed, 2s. Drawings.*]

A.D. 1862, September 10.—No. 2490.

BARCLAY, Andrew.—(*Provisional protection only.*)—"Traction engines," &c.

Improvements on No. 646, A.D. 1862.

In "traction engines of the 'right-angled class,'" the crank shaft of each pair of engines "has its bearings at one end "arranged in the side standard or frame, whilst the other end "is connected to the main axle, or to the centre of the driving "wheel, so that this end of the shaft vibrates with the motion "of the spring of the driving wheel, whilst the other end "remains a fixture in its bearings." The object of this is "to prevent the vibration of the driving wheel from affecting "the beat of the valves." One driving wheel has a tubular axle within which the other axle passes. Or the two axles may be arranged parallel "to rotate in contact, and thus "obtain an extended bearing surface when the engines are "driven at different speeds." The vehicle drawn by the engine is coupled thereto by a T-shaped piece, The engine is steered by a "duplex break action" the break being applied to either of the wheels as required.

An improved pressure gauge is also described.

[*Printed, 4d. No Drawings.*]

A.D. 1862, September 19.—No. 2572.

SAVAGE, Frederick.—(*Provisional protection only.*)—"Traction engines."

The improvements relate to the clutches used for throwing the driving wheels in and out of gear and are thus described by the inventor:—"I make the teeth of the clutch which "engage the one with the other inclined at their sides in "place of straight as is usual, so that the incline of the teeth "may give the clutch a slight tendency to come out of gear. "I also make the teeth of the clutch much more numerous "than is usual for an ordinary traction engine. I commonly "employ about sixteen teeth, whereas the ordinary clutch "has but two or three. I find that it is best not to form the "teeth of the two clutch plates exactly in the same manner, "but that the teeth on one of the plates should be (although "inclined) flat both on their sides and ends, whilst the teeth "of the other plate are curved or convex at their sides."

[*Printed, 4d. No Drawings.*]

A.D. 1862, October 4.—No. 2678.

LEE, JOSEPH, and LEE, WILLIAM.—"Traction engines and "boilers."

1. The main wheels are driven by a pinion on the crank shaft gearing with an intermediate wheel on the axis of which is another wheel gearing with a wheel on the driving wheel axle. "The intermediate wheels turn on a stud which project "from the bracket which carries the crank shaft, this stud, "the crank shaft and the axis of the main wheels are so "placed that their centres are all in one vertical line." Or, "two driving wheels are placed under the body part of the "boiler" and these are driven by differential spur wheels from a second shaft under the boiler.

2. In boilers for locomotive and traction engines the horizontal tubes from the fire box lead into a smoke box whence vertical tubes lead through the steam chest into a chimney which "can be turned down when the tubes require "cleaning."

[*Printed, 4d. No Drawings.*]

1863.

A.D. 1863, January 1.—No. 6.

FAULDS, ROBERT.—(*Provisional protection only.*)—"Traction "engines or common road locomotives."

The invention consists in applying the driving power to more than a single pair of wheels. This may be done by worms gearing with worm wheels on the wheel axles, or by spur or bevel gearing, or one pair may be driven and motion communicated to the others by connecting rods. Clutches or other suitable means are employed for enabling the wheels at either side only to be driven, or a separate pair of wheels on "a bogie or swivelling frame" may be used for steering, "in connection with which provision may be made for "causing the load to bear more or less upon them."

[*Printed, 4d. No Drawings.*]

A.D. 1863, January 3.—No. 23.

JONES, HARRY. — (*Provisional protection only.*) — Steam engines.

" The invention relates, first, to those descriptions of steam " engines wherein the waste steam is not condensed (for in- " stance, as in locomotive or traction engines, where it is used " to increase the draught of the furnace) and is designed to " regulate the amount of such strength. The first part of the " invention consists in regulating the current of air caused " by the waste steam by lengthening or shortening the ' blast " pipe,' " through which the steam passes, for which purpose " the upper part of the pipe is made to slide on the lower and " arranged with neck and pinions or otherwise, so as to be " received or lowered by the engine driver as required, the " draught being decreased as the aperture of the ' blast pipe ' " approaches the top of the funnel or smoke outlet; and in- " creased as it is lowered therefrom. A second part of the " invention consists in connecting the axle-boxes of traction " engines together by a bar embracing or connecting all the " axle-boxes on one side of the engine together, and those on " the opposite side by a second bar, so as to distribute or " equalize the stream thereupon."

[*Printed*, 4*d*. *No Drawings.*]

A.D. 1863, January 7.—No. 61.

AVELING, THOMAS.—" Traction engines."

The following is the description given in the Provisional Specification. It corresponds with that of the Final Specification:—

" In these engines the motion is communicated through " gearing from the crank shaft to the driving wheels. The " intermediate gearing I mount on a countershaft, the bear- " ings for which I form in the same brackets that carry the " crank shaft. Keyed to the opposite ends of the counter- " shaft are spur wheels having different numbers of teeth to " suit two different speeds of driving, and into these wheels gear " spur pinions of varying diameter on the crank shaft. These " pinions are free to slide on their shaft in order that either " may be thrown into action at pleasure according to the

" driving speed required. They are by preference shifted by
" hand and kept in or out of gear, as the case may be, by the
" application of elastic clips composed of leather and steel
" which clasping the shaft at either side of the boss of the
" pinions will act like a fixed collar on the shaft and main-
" tain them in the required lateral position. The driving
" motion I prefer to transmit through a chain and chain
" pinions and wheel" (as described in No. 1995, A.D. 1859.)
" The chain pinion is keyed to the counter shaft, and to allow
" of the slack of the chain being taken up, I set the counter
" shaft bearings in segment slots struck from the axis of the
" crank shaft. The bearings may be raised to any required
" height suitable for bringing the chain to tension by means
" of blocks, and then held firmly by binding screws. For
" still further varying the speed, it is only necessary to shift
" the chain pinion for one of less or more teeth."

[*Printed*, 10*d*. *Drawing*.]

A.D. 1863, January 12.—No. 99.

NEWTON, WILLIAM EDWARD.—(*A communication from Perry Dickson and William Ashley Jones.*)—" Stationary and traction " engines, propellers, and other machinery."

The invention relates to communicating power from a steam cylinder to the driving shaft. A rock shaft is mounted loose on the driving shaft, and this fits within the rim of a flanged pulley fast on the shaft. At each end of this rock shaft is pivoted a small piece which jams against the rim when the rock shaft is moved in one direction, but swings loose when the rock shaft is moved in the other direction. Arrangements are provided for putting one of these catches out of gear, so that an intermittent motion of the rock shaft imparts a rotary one to the pulley and through it to the shaft. There is a similar arrangement on each side of the pulley. From one side of the rock shaft a connecting rod leads to a second rock shaft on a shaft parallel to the driving shaft, the other end of this rock shaft being connected with the gear on the other side of the pulley. Motion is imparted to this second rock shaft by a connecting rod jointed to a slide on a vertical lever, the upper end of which is pivoted to a fixed point, and the lower end jointed to the end of the piston rod. By means of a rack the slide can be adjusted at any height, and the amount of its movement consequently regulated.

[*Printed*, 6*d*. *Drawing*.]

A.D. 1863, February 9.—No. 357.

LAW, David, and DOWNIE, John.—" Traction and common " road locomotives."

The steering and manœuvring of such engines is effected by more or less inclining the axles of the driving wheels, so that when operating to change the direction of motion, they are made to deviate from their normal parallel position and assume respectively, in relation to each other, angles more or less acute. Each engine has two pairs of driving wheels; upon each of the axles mounted on springs is a kind of " bogie"; these support the main carriage framing, and are capable of swivelling, in accordance with the steering action, without affecting the transmission of power through the wheel. The swivelling movement is effected by means of toothed segments fixed to the " bogies" acted upon by worm wheels by means of a hand wheel mounted upon a standard; the two worm shafts being connected by intermediate shafts and pairs of bevels. " Various arrangements of steam boiler " and engine details may be provided." In one arrangement a vertical multitubular boiler is employed which may be suspended on trunnions so as to maintain an upright position when the engine is ascending and descending inclines. The boiler is placed between the " bogies" and their vertical driving shafts, and rests upon suitable brackets fixed to the main framing. There are two cylinders disposed respectively on each side of the boiler. The piston rods pass through the cylinders and drive crank shafts from each end. Friction brakes arranged to act simultaneously on all the wheels are provided. The ordinary link motion is adapted for operating the valves by means of eccentrics which are mounted on one crank shaft, and other eccentrics are mounted on the other crank shaft for working the feed pumps. It is intended to employ the chimney blast, and in addition in order to suppress the sound and appearance of white vapour outside, to provide for exhausting the cylinders into the water tank through a box fitted with diaphragms of wire gauze, and into which also the feed water is directed when the connection with the boiler is closed. Air is also made to pass through tubes arranged across the feed tank, which communicate with the ash-pit and fire-box, whereto the air is conducted by means of a "belt," which encircles the boiler above the grate bars. "A donkey feed pump" may be arranged to draw water from a road-side stream, &c. This engine may also work the steering gear.

[*Printed*, 1*s*. 10*d*. *Drawings*.]

A.D. 1863, March 11.—No. 669.

BARCLAY, Andrew.—"Traction engines."

In "traction engines of the 'right-angled class,'" the crank shaft of each pair of engines "has its bearings at one " end arranged in the side standard or frame, whilst the other " end is connected to the main axle or to the centre of the " driving wheel, so that this end of the shaft vibrates with the " motion of the spring of the driving wheel, whilst the other " end remains a fixture in its bearing." The object of this arrangement is "to prevent the vibration of the driving wheels " from affecting the beat of the valves." One driving wheel has a tubular axle, within which the axle of the other wheel passes. Or the two axles may " be arranged parallel to rotate " in contact, and thus obtain an extended bearing surface " when the engines are driven at different speeds." The vehicle drawn by the engine is coupled thereto by a T-shaped piece. The engine is steered by a "duplex break " action," a break being applied to either wheel as required. An improved pressure gauge is described in which there is an elastic diaphragm, supporting a column of water in a closed tube. The steam acts on the other side of the diaphragm, and compresses the air above the water.

[*Printed*, 10*d*. *Drawing*.]

A.D. 1863, March 21.—No. 754.

ROBERTS, Frederick, and ROBERTS, Alexander.—"Im-" provements in agricultural implements, and in apparatus " for working the same."

An agricultural engine is described. The boiler is vertical, and is placed at one end of the frame between the main driving

wheels. "At the other end there is, by preference, a pair of
" smaller wheels arranged with swivelling gear for steering
" purposes. These wheels may also be arranged to rock, so
" as to accommodate themselves to inequalities in the ground
" surface. The winding drums are mounted on a horizontal
" shaft disposed longitudinally, and the first motion shaft is
" placed in a parallel position above. The first motion or
" crank shaft is actuated (by preference) by two steam cylinders
" placed above one of the drums, and the drums are actuated
" by a pinion on the first motion shaft in gear with a spur
" wheel on the drum shaft, a clutch or clutches being provided
" for throwing either drum into or out of gear. For
" actuating the driving wheels, toothed rings or wheels are
" fixed or formed on the inner faces thereof, and these toothed
" rings are encircled by endless chains driven by toothed
" pinions on a transverse horizontal shaft receiving motion
" from the first motion shaft by means of three bevel wheels
" with clutch for giving motion in either direction. On the
" end of the first motion shaft there is a fly-wheel shaped to
" act as a driving pulley, when it is wished to employ the
" engine for actuating thrashing or other machines. The
" framing may be continued beyond the boiler to support a
" water tank and coal box, and a platform for the driver; the
" framing also may be made hollow, so as itself to form a
" tank."

[*Printed*, 2*s*. *Drawings*.]

A.D. 1863, March 21.—No. 756.

BIDDELL, George Arthur.—"Traction engines to be used
" on common roads."

"These improvements consist in the application and use of
" a friction clutch or clutches in combination with suitable
" driving and disengaging gear." The piston rod, through the connecting rod, gives motion to the crank shaft, whereon is fixed the fly-wheel, and also, by preference, the friction clutch, whereof the sliding half is always turning with the shaft by means of a fixed feather, whilst the other half, which carries a tooth wheel, is confined between collars fixed upon the shaft, and only turns with it when the two halves of the clutch are pressed or clasped together. The toothed wheel gears into another wheel upon a second shaft, whereon are

two toothed pinions which have liberty to slide longitudinally, but are compelled to turn with the shaft by fixed keys or feathers; these pinions are coupled together, and moved simultaneously by a double crank, connecting rods, and forked levers, or their equivalents, in such manner respectively, that when one goes out of gear the other slides in; the sliding movement of the pinions is effected by interposed mechanism and cranks on a separate shaft, whereon also there is a lever handle for turning in either direction. One pinion engages with the internal gearing of a spur wheel, and the other with a spur wheel of lesser diameter externally geared. These spur wheels are fixed on another shaft which carries at each end a sliding pinion, which gear respectively into the annular gearing attached to the driving or main road wheels.

[*Printed*, 1*s*. 10*d*. *Drawings*.]

A.D. 1863, April 7.—No. 880.

HOWARD, JAMES, BOUSFIELD, EDWARD TENNEY, and PINNEY, JOHN.—Agricultural steam engines and implements.

The first part of the invention relates to steam engines. The engine frame is borne by a pair of carrying wheels, which are fitted with internal toothed rings; when locomotion is required, these wheels are driven by gearing brought into activity, in connection with the crank shaft and bevel gearing, by friction discs or clutches. The barrels for carrying the traction ropes are mounted on the engine frame beneath the crank shaft, and are driven by gearing direct therefrom; the crank shaft is longitudinally disposed and runs through a divided or horse-shoe-formed boiler. By means of eccentrics on the axis, the barrels can be lowered and the shaft thrown out of gear. The two limbs or sides of the boiler are alike; each part may contain a cylindrical or rectangular fire-box surrounded by water spaces; rows of tapering water tubes, inclining from the sides of each fire-box, near to the fire-bars, communicate through the top with the water space above. The arched top of the boiler constitutes the steam space, which is covered by a casing, forming an arched chamber or superheater, whereunto, through short lateral flue tubes, the flaming products of combustion pass from the top of each furnace respectively to the chimney. The cylinders are vertically disposed between the supporting limbs of the boiler, the pistons and connecting rods working upwards direct upon the crank shaft. The steering wheel is operated by a pinion which gears into a toothed sector, so coupled with the intermediate sliding shaft as to be able to throw either one or other of the carrying wheels out of gear, whereby the engine can be made to turn in double the space of its own breadth. When the engine is drawn by a horse, the steering gear is dispensed with. Instead of two barrels for carrying the rope, a hollow drum is used, whereon, mounted upon frames bolted to the interior, is a barrel, upon which that portion of the rope intended for use is wound, being guided thereon by sheaves; the barrel is rotated by a worm and worm wheel when not interlocked therewith. One end of the rope is fixed to the periphery of the drum, and a portion wound thereon equal to the length of traverse of the tilling implement, another portion is passed round the field, and the remainder is wound upon the barrel, passing thereto through a suitable opening in the surface of the drum; slack is taken up upon the barrel by the attendant who, by reversing motion, can regulate the length of rope required.

The second part relates to a method of raising the ploughs of "double action" steam ploughs.

The third part relates to a method of applying the "fly-" rope" system to double action ploughs.

[*Printed*, 1*s*. 10*d*. *Drawings*.]

A.D. 1863, April 13.—No. 926.

ROLFE, Alfred.—(*Provisional protection only.*)—"Propelling " carriages on railways, tramways, or on common roads."

Motion is to be given to fly wheels by men working handles, or it may be by means of steam or other engines. By means of belts and pulleys the motion is communicated to the bearing wheels of the carriage. When the carriage is to be stopped one of the belts is shifted to a loose pulley, but the power is then applied to work the fly wheel, and "is accumu-" lated by the fly wheel until required for starting." It is also stated that the power of the brakes used to stop the carriage may be stored up in the fly wheel.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1863, June 13.—No. 1482.

BLACKBURN, Robert.—" Traction engines."

Improvements on No. 414, A.D. 1857.

The boilers are mounted on "flanged wheels which run " upon rails fixed on the inner surface of the drum." Also the boilers are placed " parallel with the length of the drum." " Guide wheels are also provided inside the drum to assist " in keeping the boilers in their proper horizontal line." " The engines are supported upon a frame in front of the " drum and between it and the front guide wheels, and the " power therefrom is transmitted to the drum." The boilers are connected to this frame.

[*Printed*, 8*d*. *Drawing*.]

A.D. 1863, June 19.—No. 1538.

MOREL, Augustin.—" Traction engines."

The steam is generated by the combustion of inflammable oils. The engine is mounted on two hind wheels, free to turn in either direction upon an ordinary axle, which passes through an opening between the sections of the boiler, and upon two fore wheels which answer the two-fold purpose of driving and steering wheels. The boiler is supported by two laminated side springs which bear upon the after axle; it consists of two horizontal cylindrical chambers, disposed one over the other and united by short vertical tubular connections; the upper part of the chimney casing constitutes the steam chamber above the water level, which rises and is established therein above the top of the boiler. The fire-place is at the after end, within the lowest section of the boiler; it contains hollow metal blades or burners, placed one against another in connection with a feeding tube, through which the inflammable fluid is supplied to asbestos wicks and burners, in regulated quantities by means of a float; arrangements are provided for the admission of the requisite quantity of air to support the inflammation of the evolved gases, which in a flaming state course through a central longitudinal flue tube to the fore end, and there pass up a short vertical passage into the upper section of the boiler which contains two longitudinal flue tubes, through which the hot draughts go and return to the chimney tube above which passes up through the surrounding water at its base and through the steam chamber above. The cylinders are horizontally disposed at the sides of the boiler, and by their respective pistons and connecting rods, give motion to a transverse crank shaft, the ends of which are supported by stay rods. The tank, which is at the fore part of the engine, is closed and the water contained is forced into the boiler by pumping air into the tank.

The brakes are worked by the air compressed in the tank, and motion is communicated to the fore axle by pulleys and straps. A variety of devices and contrivances are adopted for placing every necessary movement of the engine under the control of the driver, who is seated in front and taught to consider himself driving a "blind" or "automatic horse," the name by which the engine is designated.

The engine may be used, among other purposes, for drawing a plough behind it.

[*Printed*, 10*d*. *Drawing*.]

A.D. 1863, July 10.—No. 1726.

HORNSBY, Richard, junior, BONNALL, John, and ASTBURY, William.—" Traction engines," &c.

The boiler is preferably horizontal and tubular. The cylinders are at the bottom of the smoke box or under the boiler. The pistons are fitted with trunks. The crank shaft is below the boiler and has a fly wheel on it. A chain pinion on a countershaft drives a wheel on the axle of the hind bearing wheels. The engine rests on springs on the frame.

In agricultural engines a winding drum or drums are mounted on a horizontal shaft under the boiler. They are driven from a chain pinion on the counter shaft abovementioned, this pinion being loose on the shaft, but capable of being clutched thereto. The drums are also loose, and either can be clutched to its shaft.

The driving chain is made of three sorts of links, "circular " or ring links," " segment pieces," and connecting links.

[*Printed*, 4*s*. 4*d*. *Drawings*.]

A.D. 1863, August 28.—No. 2128.

ALISON, John.—" Apparatus for tilling land."

Among other apparatus an agricultural engine is described. The hauling drum is on an adjustable swinging frame after the manner described in No. 191, A.D. 1862. " The axis of this " frame " is " in the centre line of the frame of the imple- " ment," a vertical boiler being used instead of a horizontal one. The crank shaft passes through the smoke box, and a bevel wheel on one end of it gives motion, through suitable bevel gearing, to the drum, whatever position it may be in. The other end of the crank shaft gives motion to a pair of bearing wheels, two speeds being provided by the use of suitable gearing. The axle of the front pair of wheels can incline both vertically and horizontally and is mounted on a bar or pole projecting forward from the frame of the engine. By means of a handwheel working through a worm and worm wheel and suitable bevil gearing, these wheels are steered.

[*Printed*, 2*s*. 2*d*. *Drawings*.]

A.D. 1863, October 13.—No. 2510.

ROLFE, Alfred.—(*Provisional protection only.*)—" Propelling " carriages on railways, tramways, or on common roads."

Motion is to be given to fly wheels by men working handles, or it may be by means of steam or other engines. By means of belts and pulleys the motion is communicated to the bearing wheels of the carriage. When the carriage is to be stopped one of the belts is shifted to a loose pulley, but the power is then applied to work the fly wheel, and " is accumu- " lated by the fly wheel until required for starting." It is also stated that the power of the brakes used to stop the carriage may be stored up in the fly wheel.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1863, November 14.—No. 2858.

BROOMAN, Richard Archibald. — (*A communication from Jean Baptiste Pierret and André Schweizer.*)—" Engines and " boilers specially applicable for agricultural purposes."

The furnace is shaped as a truncated cone and is placed within a cylindrical boiler. Water spaces are formed traversing the boiler. At the ends of the boiler are a number of

tubes fixed in a "tubular plate," and through these "the
" return of the flame and the products of combustion takes
" place."

The engine is a rotary one. " A cylinder closed at the two
" ends by plates carrying stuffing boxes is made with an
" opening for the outlet of steam while the inlet takes place
" through one of the plates. At the upper part of the cylinder
" an opening or recess is made for the reception of a movable
" slide upon the back of which springs are made to press.
" The axis of the circular piston, which is also the main shaft
" of the engine, is placed excentrically in the ratio of one to
" six of the radius of the cylinder so as to be in contact with
" the movable slide. The piston is formed with two mortises
" in which two slides work, and these slides are kept in
" contact with the interior of the cylinder by steam introduced
" behind them. To compensate for the lateral wear of the
" piston slides a plate is inserted inside one of the end plates
" before named, and is kept pressed inwards by springs."

[*Printed,* 8*d.* *Drawing.*]

A.D. 1863, December 9.—No. 3104.

MACKLIN, William.—(*Provisional protection only.*)—" Re-
" versing the motion of locomotives and other steam engines."

The invention may be applied to traction engines. The eccentric or eccentrics is or are mounted on a sleeve on the crank shaft. This sleeve has two inclined slots in it, and the shaft two straight grooves. Two pins on a collar pass through the slots into the grooves, and by shifting this collar the sleeve is rotated and with it the eccentrics.

[*Printed,* 4*d.* *No Drawings.*]

A.D. 1863, December 11.—No. 3126.

WEBB, Thomas.—Agricultural and traction engines.

The leading wheels are driven from the nipping drum employed for hauling the implements. The wheels are loose on their axle. A vertical axis carried by a boss on the axle has its bearings in a forked stem which can turn in a bearing mounted on the engine. The wheels are thus enabled to rise and fall over inequalities in the ground, and also to lock. An endless rope from the nipping driver passes round a small driver on the vertical axis and drives it. This motion is communicated through clutches to the wheels. When the engine is used for hauling, the endless rope is removed from the main drum. Or a separate small drum may be used. The hind driving wheels may be similarly mounted and driven. In place of the nipping drums, chain wheels and chains may be employed.

[*Printed*, 1*s*. *Drawings*.]

A.D. 1863, December 18.—No. 3195.

ADAMS, WILLIAM BRIDGES. — "Locomotive engines and "trains."

One part of the improvements as described in the Provisional Specification consists in fitting bogie frames under the engine so that they can "traverse from side to side across the upper "frame on curved lines, curved bars or slides being provided "with or without rollers to facilitate the movement." The axle box is "in two parts, the outer part being made to slide "vertically on the horn plates or axle guards, and the inner "portions to slide on curved lines horizontally within the "outer box." "When used for common roads the traction "rod is made to guide the wheels into their curved courses; "and two or three or more pairs of wheels with radial axle "boxes may be made to apply at either end of the engine" "the curves of the boxes being struck from the same horizontal centre at each end."

[*Printed*, 1*s*. *Drawing*.]

A.D. 1863, December 21.—No. 3216.

CLARK, WILLIAM, and BATHO, WILLIAM FORTHERGILL.— "Machinery or apparatus for rolling roads."

The apparatus is also available for use as a traction engine. It is "in the form of an ordinary perambulator." The place of the front wheel is supplied by a roller, of a length equal to the span between the two hind wheels. The roller is in three parts, all loose on the axle, the centre part being larger than the others, and eccentric to them. This roller is mounted in a turn-table running on friction bowls, and the axle can be turned by a worm and worm wheel so that the central part of the roller only takes the weight. "The hind rollers or wheels "have separate axles and are each in two parts, the inside parts "serve as driving wheels and are larger in diameter than the

" outside parts, and each inside part works upon an eccentric " portion of its corresponding axle, and for raising the outside " parts from the ground when required worms and worm wheels " are employed similar to those for raising the outside parts " of the front roller." An engine and boiler, the latter by preference vertical and multitubular, are mounted on a platform carried by the axles. When the apparatus is used as a traction engine the central part of the front roller and the inside parts of the back rollers only are used. When it is to be employed as a stationary engine, the engine is thrown out of gear with the wheels.

[*Printed*, 1*s*. *Drawing*.]

A.D. 1863, December 24.—No. 3260.

MARSDEN, William, and STUBBS, Francis Henry.—(*Provisional protection only*.)—" Locomotive engines."

" The object of this invention is to cause greater adhesion of " the wheels or to increase the tractive power of locomotive engines, whether employed on rails or common " roads, and in such manner or by such means that the " driver may be enabled to apply and regulate the application " of such increase of power more or less as may be required. " These improvements consist in applying to a locomotive " engine a lever or levers to which may be applied portable " and adjustable weight or weights ; the fulcrum being in any " convenient part of the framing thereof. The weight employed may be the tender, or a portable weight or weights " carried thereby, or water from the tank may be employed, " or a spring or springs attached to the tender may be " applied to the said lever or levers. The said weight or " weights may be brought into action on the said lever or " levers by other levers and connecting rods and screws or " segment wheel and worm shaft so applied and arranged as " to be actuated by a hand wheel. By these means or appliances additional weight may be placed on the engine " consequently producing greater adhesion of the wheels to " the rails or road, or increased tractive power to such " engines."

[*Printed*, 4*d*. *No Drawings*.]

1864.

A.D, 1864, January 15.—No. 114.

HOWARD, James, BOUSFIELD, Edward Tenney, and PINNEY, John.—" Engines and machinery for tilling land " by steam power."

The improvements relate to agricultural engines and hauling apparatus ; a method is also described of ploughing by the use of a pair of small engines on opposite headlands. Each of these engines is fitted with a pair of winding drums, one on each side. On one of these drums on each engine the opposite ends of the traction rope are wound. On the other drums a rope is wound by means of which the power of the engine not employed at the time in directly hauling the plough is communicated to the other engine, and the drums being connected by gearing, the power of both engines is utilised at once. The engines may be traversed along opposite headlands, or may be stationed in one part of the field and the ropes led over pulleys. The engine frame is mounted on two driving wheels behind and one steering wheel in front; the boiler, which is of the tubular class, is transversely placed upon the frame in order to afford room for the mounting of a drum on each side of it on eccentric bushes loose upon a longitudinal shaft, which passes under the boiler; a toothed ring or a spur wheel is concentrically attached to the end of each drum; these gear into pinions on the crank shaft, whereby the drums are set in motion. Whilst the hauling rope from each engine is alternately being paid out, the drums are lowered out of gear with their respective driving pinions by half a turn of their eccentric bush; when required to wind on, the eccentric bush is turned to its normal position, which raises the drum and brings the wheels into gear. When the engines are required to move on, the travelling wheels are set in motion by means of bevel gearing. The ropes are wound on and off sideways to and from the engines. The apparatus for operating the steering wheel is connected to the clutches for acting on the bearing wheels so that as the steering wheel is turned to one or other side, the bearing wheel on that side is thrown out of gear and allowed to run loose on its spindle. Other modifications of engines are shown, with longitudinal twin tubular boilers placed very low under the drums or drum. In these engines the boiler forms the framing; the main axle is attached to the top of the furnace, which is common to both boilers; the driving wheels carry internal gearing, and the cylinders are inverted and mounted upon a frame supported by the boiler. The guide pulley for laying the rope on the drum is traversed to and fro across the drum by a screwed shaft. Reference is made to No. 484, A.D. 1861, and to No. 880, A.D. 1863.

[*Printed*, 2*s*. *Drawings*.]

A.D. 1864, January 23.—No. 201.

CHAPMAN, William.—(*Provisional protection only.*)—" Traction engines and vehicles for common roads."

The invention consists in fitting to the wheels of such engines, &c., an endless railway carried by "circular or polygonal shaped carrying wheels revolving clear or out of contact from the ground upon independent axles of their own carried by the framing of the vehicle." The rails are of iron or steel, preferably "of a bridge section, the broad flanges resting upon the ground" while the wheels "bear upon the raised portion of the rails;" they are jointed together end to end, and "may have filling pieces of wood fitted on them to prevent noise" and make them fit the carrier wheels." Revolving brushes driven from the carrier wheels may be used to keep the rails clean.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1864, February 17.—No. 413.

HORNSBY, Richard, BONNALL, John, and ASTBURY, William.—Agricultural implements and engines.

"A single cylinder traction engine with two winding drums on a horizontal and longitudinal axis" is used. The toothed wheels, chains and drums are made of malleable cast iron or cast steel, preferably of "Mc Haffie's metal." When the engine is working two ploughs simultaneously, according to a method described in the Specification, one of the winding drums is wider than the other, so that it may carry double the amount of rope. The axle slides in guides "pivotted to " a fixed axle box or to the horn plates or frame so that the " guides are able to remain constantly at right angles to the " axle." The fire box may be of malleable cast iron, cast steel or "Mc Haffie's metal." The engine is steered by chains attached to the ends of the leading axle and also to a horizontal screw which by means of a nut which can turn on the screw but is prevented from lateral motion, is caused to move lengthways of its direction, and so operate the chains.

[*Printed*, 3*s*. 2*d*. *Drawings*.]

A.D. 1864, February 20.—No. 439.

ALLEN, Edward Ellis.—"Locomotive and portable engines, " including in the latter class those used for traction purposes " and for steam ploughing."

1. The cylinder is made double the ordinary length, and divided by an internal transverse partition into two equal lengths; in each half there is an ordinary piston; these pistons are united by a trunk which works through the partition. Steam is admitted to the pistons alternately in the annular spaces round the trunk on each side of the partition, and thence exhausts alternately into the ends of the cylinder respectively. When economy of space is required, the trunk may be utilised as a cylinder, to be operated by a motionless piston.

2. Valves of double expansive trunk engines. The annular space and the other end of the cylinder communicate through the piston by means of valves which may be opened and closed by the motion of the piston, by means of projecting studs, acting alternately against the sides of the division plate and the cylinder ends.

3. Forming a steam case upon the boilers of portable engines for the purpose of enclosing the cylinder and valve chest; it has free communication with the boiler by means of holes through the shell. In some cases simply a casing encloses the cylinder.

4. Preventing loss of heat and condensation by adding to the single trunk engine, a trunk casing into which the trunk attached to the piston works to and forth. This casing may

be formed in one casting with the cylinder or bolted on the cover.

5. Fitting to locomotive and portable engines, atmospheric condensers formed by preference of very small copper or brass tubules, fitted into plates of hard wood or metal. The course of the exhaust steam is amongst the tubes in the spaces between them. A rapid current of cold air is induced through the tubes which (excepting the air passage from the condenser) form the only air channel to the ash-pit, which is otherwise closed. In some cases the air may pass amongst the tubes and the steam through them; the water of condensation is returned to the boilers.

6. Using hollow rivets for uniting the links of traction chains.

7. Attaching to portable engines, charcoal filters formed of cylindrical or other shaped blocks conveniently arranged and fixed upon perforated tubes which unite in a central main pipe connected with the pump or injector.

[*Printed*, 1*s*. *Drawing*.]

A.D. 1864, March 23.—No. 732.

MOREL, Augustin.—" Traction engines."

Improvements on No. 1538, A.D. 1863, in which an " auto-" maton horse " is described.

1. Adding to the arrangement described in that Specification a second engine mounted behind the main engine, and provided with ordinary locomotive reversing gear to effect backward movement; this second engine gives motion to the two hind wheels, which, by means of ordinary bands and pulleys, and tension pulleys, can be made to act conjointly or independently of the main engine.

2. Instead of placing the engine in the centre, and giving motion to all four of the wheels according to the former invention, the main engine is carried on the fore part of the frame, and actuates the forward wheels only; it has no reversing gear, turns always in the same direction, and ceases to actuate the fore wheels when the driving bands are loosened, which then slip on the pulleys. The steering is performed by operating on the fore wheels; the engine receives its steam direct from the boiler, and when of sufficient tractive power,

the hind part of the arrangements follows without being directly acted upon. Both engines may take their steam from the boiler.

3. The front or main engine having used the steam, may exhaust into a receiver provided with two cocks, one to open to the atmosphere, and the other free to communicate with the second engine behind, where the steam may be re-employed.

4. The boiler furnace is arranged to burn either liquid or solid fuel or both : when burned together the inflammable liquid is injected upon the burning fuel.

5. The conductor's seat is always turned in the direction of the line of progress.

6. Fitting conical breaks on the axles so as to act on the pulleys of the hind wheels.

7. Instead of employing straps and pulleys for transmitting the motive power of the engines to the wheels toothed wheels and pinions are used.

8. The tension pulleys are adjusted so as to act upon and tighten or loosen the driving bands respectively, when the machine is required to move out of a direct course.

9. Mounting the wheels on long metal sockets which carry the driving band pulleys and are acted upon by the breaks, whereby the wheels are driven irrespective of each other.

[*Printed,* 10*d*. *Drawing.*]

A.D. 1864, March 24.—No. 750.

ROBERTS, WILLIAM.—(*Provisional protection only.*)—" Traction and hauling engines."

The drum is mounted below the axle of the front steering wheels, on the "axis or pin of the locking motion of the fore " wheels." The engine is mounted on a pair of driving wheels behind and a pair of locking wheels in front. Near the back of the framing is a vertical boiler with a tank under the framing. The cylinders are in an inclined position in front. The crank shaft is about the centre, and communicates motion to an intermediate shaft with chain pinions thereon whence motion is given to the driving wheels. The intermediate shaft is in two parts butting together, and each part has a bevel wheel on it. "Between the two bevelled wheels

" and turning loosely on the two parts of the axis is a frame " with a bevelled pinion or pinions gearing with both the " bevelled wheels." " This arrangement is made in order " that one of the driving wheels may be able to rotate more " rapidly than the other." The drum is also driven by suitable gearing from the crank shaft. The fore axle passes through an "eye" in the pin of the locking motion, and is secured by a pin therein, so that the wheels may adjust themselves to inequalities in the road.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1864, April 13.—No. 934.

COPE, JAMES.—" Apparatus employed for steam ploughing."

The improvements refer to agricultural engines. The first part of the invention relates to an anchor by which the engine can be secured in its place. This consists of a disc eccentrically mounted so that it can be caused to rotate and thus cut its way into the ground. It may be mounted in bearings at the end of a lever, or in a rocking frame, motion being given to its spindle by a pulley thereon and an endless band from the engine, by a screw and sector, or otherwise. It may also be mounted on the frame of the engine, on the axle of the running wheels, or on one of the wheels which is formed in two parts, the disc being between them on a sleeve on the axle. The second part of the invention consists in mounting the winding drum horizontally under the lower part of the boiler, about on a level with the fire bars, and supporting it by means of friction wheels or rollers; the object of this low position is to enable resistance to be more favourably offered to the pull of the rope. By means of a supporting screw, the boiler is maintained in a horizontal position when descending or ascending inclines; this apparatus, which by means of suitable connections is operated by the attendant, is applied at one end of the boiler. Instead of by the screw, the end of the boiler may be raised or lowered by a hydraulic pump, upon the plunger of which it is disposed; the end of the boiler may also be mounted on the cranked axle of the running wheels, which is turned by a worm and worm wheel to raise and lower the boiler end. The last part consists in giving the axles of the running wheels liberty to rock on a centre, so that the wheels, however uneven the surface of the ground may be, may always be in contact therewith, whilst the body of the engine maintains its normal position. The boiler is mounted on a short vertical cylinder, which fits over the end of another similar cylinder carried by the wheels. The edges of the cylinders in contact are bevelled off to allow of the requisite motion. This arrangement allows of one wheel being lifted, so that the traction rope can be passed under it.

[*Printed*, 1*s*. 10*d*. *Drawings*.]

A.D. 1864, May 6.—No. 1153.

TOMLINSON, John.—(*Provisional protection only.*)—" Apply-
" ing motive power in the traction of omnibuses or other
" vehicles travelling upon highways or roads, the same being
" also applicable to ploughs or other agricultural imple-
" ments."

The invention is described as applied to an omnibus, and no special description of its application to an agricultural engine is given. The bearings of the wheels rise and fall in slots, and are acted on by springs, so that the carriage keeps its level on a hill side. The bearing wheels are driven by endless bands from pulleys on the crank shaft to pulleys on the axle.
" Beneath the fore part of the engine a cylinder projects,
" which is received by another cylinder in which it works
" steam-tight, and from one side of the outer cylinder a lever
" projects which is connected with the ends of a chain passed
" round two grooved pulleys attached to the main framing.
" The chain is attached to any convenient apparatus for mov-
" ing it, so that the lever and outer cylinder are capable of
" being partially rotated. The outer cylinder has underneath
" it, at or near its centre, a pin, hinge, or other contrivance,
" upon which an axle is free to turn vertically, the axle also
" moving in spring slotted bearings." " The ends of the axle
" have only a vertical motion, and are provided with wheels
" which revolve upon it; the axle and wheels being partially
" rotated by the chain, as described, and steam being admitted
" into the cylinders, the body of the engine will be raised by
" the pressure thereof, thereby causing the vehicle to maintain
" its level in going down hill."

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1864, May 31.—No. 1351.

FOWLER, John, and WEBB, Thomas.—"Steam carriages "for common roads, and steam-engines."

The portion of the invention relating to traction and agricultural engines consists in a method of condensing the exhaust steam by the water in the tank. To keep the water cool the air which feeds the fire passes through tubes surrounded by the water. When the steam is all condensed, and none of it is used for the blast, a fan driven by the engine is employed to produce an air blast. This fan draws air through some of the tubes in the tank, while the rest of the tubes convey air to the fire.

[*Printed*, 1s. 4*d*. *Drawings*.]

A.D. 1864, June 3.—No. 1379.

LEE, Joseph William.—(*Provisional protection only*.)—"Trac"tion engines."

Improvements on No. 1331, A.D. 1861, and No. 2678, A.D. 1862.

1. The chain wheel described in one of the above Specifications is tightened by setting the axle of the wheel round which it passes in sliding brackets.

2. The countershaft is parallel to the main axle and geared with "two spur pinions and pitch chain pinion for the "purpose of giving motion to the driving axle."

3. A drum and rope are used for winding the engine up hills, &c.

4. The driving wheels are connected to the axle by friction plates.

5. A "spiral or volute spring" or an india-rubber spring is fitted to the main axle.

6. The fly wheel has a cover to hide it from horses.

7. There is "an auxiliary cylinder fixed to a carriage "placed next to the traction engine." This is supplied with steam from the engine boiler, and is to be used in ascending inclines.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1864, June 23.—No. 1585.

TURNER, Edward Rush, and TURNER, Frederick.—"Trac"tion, locomotive, agricultural, and other portable engines."

The invention is applicable to such engines as have a locking motion in front. "The improvements consist in extending " the upper plating of the steam boiler beyond the fore end " of the boiler. This projection at the end of the boiler has " applied to it the vertical shaft, by which the fore wheel or " wheels are caused to lock." The locking motion is preferably effected by a worm gearing into a worm wheel on the upper part of the vertical shaft. In this arrangement the wheels " may be of comparatively large diameter, and when two are " used they can be caused to lock under the extended upper " part of the end of the boiler."

[*Printed*, 10*d*. *Drawing*.]

A.D. 1864, June 29.—No. 1626.

CLARK, William.—(*A communication from Aristide Paul Blanchet*).—(*Provisional protection only.*)—"Application of steam " power to the cultivation of land."

The Provisional Specification describes the construction of an engine, which is so arranged as to be capable of alternately moving forward and drawing the implement up to it. The implement is connected to the engine by a rope wound on a drum. While the engine is moving forward, the drum runs free and allows the rope to be unwound; as soon as the forward motion of the engine is stopped, the drum is thrown into gear and winds the implement up to the engine. There are two cylinders, one on each side of the fire-box, inclining downwards in the direction of a crank shaft transversely disposed underneath the boiler; on this shaft there are loosely mounted, one on the centre and one at each extremity outside the framing, three chain pinions which can be made fast by means of clutches. There are two large hind wheels mounted on spring axles, and two smaller in front, which turn on central pivots; the peripheries of these wheels are made with cross ribs on broad felloes to prevent slipping or sinking into the land. Fixed on the axis of the large wheels there is a chain wheel, which, by means of an endless chain, obtains motion from the central chain pinion on the crank shaft, and thus drives the wheels. The small wheels support the fore end of the machine, and by means of suitable gear actuated by steering arms, they are turned so as to guide the machine. A cylindrical winding drum is transversely disposed low down at the back of the boiler, its shaft resting in bearings bolted underneath the side framing, outside which, on each end of the drum axis, there is a chain pinion which, by means of endless chains, obtains direct motion from the chain pinions which are mounted on the ends of the crank shaft; upon the drum is wound an iron wire cable, to the free end of which is attached the plough or instrument of culture. A frame or anchor is fixed to the back of the machine; it has three flukes or spurs trailing upon the surface when the machine is in motion, but which, when the hauling tension is on the rope, sink into the ground, and so stop any tendency in the machine to move back. To draw the implement up to the machine, the driving wheels by means of a lever operating on the central clutch, are thrown out of gear, and the drum set in motion; as the rope is wound on the implement is gradually drawn along. When up to the machine, the drum pinions are placed out of gear with the crank shaft, and the driving pinion thrown in, which causes the machine to move on and leave the implement in the ground, which thereby draws the rope off the drum, then free to revolve in either direction. When the machine has taken up another position, the driving wheels are again thrown out, the drum is again brought into operation, and the implement hauled another stage, and so on. Clearers are mounted in front of the machine to remove obstacles. When the machine is being moved from place to place, the drum is locked in position by palls and ratchet wheels. When the engine is required for thrashing or other similar purposes, a pulley is fitted on the end of the crank shaft.

[*Printed*, 1*s*. 8*d*. *Drawings*.]

A.D. 1864, August 9.—No. 1978.

PAYNE, Mark.—" Traction engine."

The power is transmitted to the bearing wheels through a " gear wheel of peculiar construction that receives motion " from a spur pinion attached to or cast with a chain wheel " which is actuated by an endless chain from a pinion on the " crank shaft." This wheel is composed of " two rings bolted " together with transverse rounds, into which the driving " pinion gears as into spur teeth." " The rings are bolted to

" forked arms radiating from the boss." "The axle of the " driving pinion runs under the boiler and carries a capstan " for the purpose of hauling the engine out of any slough " " by the aid of a chain and anchor." "This axle is carried " by slotted brackets and is capable of being shifted in order " to throw the pinion in and out of gear. When out of gear " with the wheel before-mentioned this pinion may be made " to drive the hauling tackle or windlass used in steam cultivation. The cylinder or cylinders can be mounted either " above or below the boiler and within the smoke box." The cross head works on a single fixed guide carried by the cylinder cover and supported by a bracket on the shell of the boiler.

[*Printed*, 10*d*. *Drawing*.]

A.D. 1864, October 7.—No. 2466.

STEEVENS, William. — (*Provisional protection only.*) — " Steam engines and implements for the cultivation of the " land by steam power."

The first part of the invention relates to agricultural steam engines. Instead of attaching the engine cylinder and working parts of the engine to the boiler, they are mounted on a plate bolted upon a strong horizontal iron girder frame, which supports the boiler and two large winding drums. The object of this arrangement is to avoid the strain which prejudicially affects the boiler, when the engine is attached thereto.

The second part relates to improvements in arranging sets of "ploughs and other implements for tilling the land by " steam power."

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1864, October 8.—No. 2481.

COLEMAN, Henry Septimus, and MORTON, Alfred George Edwin.—"Application of steam power to the cultivation of " land."

The first part of the invention relates to a method of ploughing. Two engines and two implements are used, with one endless rope. One implement works from the centre of the field up to the engine, the other from the opposite engine to the centre of the field. They work alternately, one running back over the unbroken ground while the other is in operation.

Both engines are effective at the same time. One acts directly on the implement at work, the other draws back the implement not at work, and also acts on the drum of the first engine, transmitting its surplus power through it to the first implement. The second part of the invention refers to hauling drums. The drum is mounted on a vertical stud below the boiler, and receives its motion from a pinion on a vertical shaft driven by the engine, gearing with a toothed flange on the drum. The rope is an endless one, and instead of passing round the actual periphery of the drum it is laid over grooved pulleys carried by the drum. The plane of the rotation of these pulleys is at right angles to that of the drum itself and the grooves in them being parallel to their axes, are consequently tangential to the surface of the drum, or in the line of the rope wound on the drum. The rope forms two helical coils on the drum, and the pulleys, by a fixed screw on the frame, are caused to rotate slowly and thereby carry the rope sideways in one direction so as to counteract its tendency to move sideways in the other direction, owing to its coils forming a screw on the drum.

[*Printed*, 10*d*. *Drawing*.]

A.D. 1864, October 13.—No. 2527.

HENRY, MICHAEL.—(*A communication from E. Gellerat et Compagnie.*)—Improvements in steam rollers, partly applicable to traction and portable engines.

In the case of traction or portable engines " the axles of the " bearing or propelling wheels are driven from the centre, " and are turned thereon by the following arrangements:—On " the axle box of each axle is a frame, on which is a hoop or " ring, into which fits another hoop or ring connected with " the general framework. These rings may be in direct " contact with each other, or friction rollers may be inter- " posed between them, so that each axle will work like the " fore axle of ordinary four-wheeled carriages, except that " two rings are used instead of a pole pin and socket, and the " arrangements whereby motion is transmitted from the " engine may be placed within the rings." The crank shaft of the engine is connected with the axles of the bearing wheels by means of chains and chain wheels, "the chains

" being sufficiently flexible to keep the wheels in gear even " when the axles converge or are moved out of the parallel;" or shafting with beveled gearing may be used for the same purpose. " The axles are caused to converge or move out of " the parallel by a pair of horizontal levers fixed to the rings, " supported by the framing connected with the axles; the " free ends of these levers are brought nearer to or farther " from each other, and may for that purpose be worked both " at the same time by a horizontal transverse screw carrying " a nut, to which the ends of the levers are connected by " stays, or a pair of transverse screws may be used instead of " a single one, so that each lever (and therefore each axle) " may be worked or caused to converge separately instead of " both levers together."

[*Printed*, 8*d*. *Drawing*.]

A.D. 1864, October 27.—No. 2662.

CRAVEN, JOHN, and FOX, SAMSON.—(*Provisional protection only*.)—" Railway rolling stock and agricultural and traction " engines."

" Each wheel is fixed upon a separate axle, and the inner " ends of the two axles to each pair of wheels are supported " in moveable bearings carried in each end of a connecting " link or the two arms of a lever placed intermediate betwixt " the two wheels and hinged in the middle on a stud fixed to " the framing of the engine or carriage so as to be capable of " swivelling thereon. The outer ends of the axles are sup- " ported in the usual kind of axle boxes, which are formed and " arranged so as to allow oscillation of the axles. The lever " bearings of one pair of axles may be connected diagonally " by a rod to the lever bearings of the next pair." " Agri- " cultural and traction engines may be turned or moved in " very sharp curves by the application of those improvements " and any ordinary steering apparatus."

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1864, November 8.—No. 2764.

ADAMS, WILLIAM BRIDGES. — " Locomotive engines and " trains."

The improvements "have for their object the facilitation of "movement and retardation of wheels on rails or roads." They are as follows:—

1. Arrangement of under frames, for enabling the wheels of railway carriages or waggons to turn on a centre, so as to place their axles true to curves or straight lines, when guided by the traction rod or otherwise. A fixed central turning pivot is provided for the frame or otherwise curved guides for the axle bolts to play against.

2. An arrangement of breaks attached to the frames follows the movement of the wheels; the breaks by means of weighted levers always press upon the wheels, and when not required, are lifted either by the traction rod or by chains and pulleys, operated by guard or driver, either by hand or steam.

3. Arranging on six or more wheels, long carriages, which may be built in lengths and joined together afterwards, the wheels being fixed in horn plates. The axles of the end wheels are provided with curved beds, which slide fore and aft between curved plates attached to the frame and keep the axles true both on curves and straight lines, free movement being allowed to the springs. Also the application of similar springs and curved axle beds to locomotive engines on eight or more wheels, either with or without friction wheels to give movement and guidance.

4. Arranging "guiding frames to wheels, the centres free, "and the end frames slot pivotted to the centre, and sliding "through curved guides."

5. An arrangement, applicable to engines or carriages, of springs and wheels with long swinging shackles and ball and socket attachments guiding quadrant irons pivotted over the inner axles and working between guides, with outside guards to keep one axle in gauge with the body while the other swings round it for working on either straight or curved lines.

6. Constructing locomotive boilers with transverse partitions, for the purpose when the boiler is ascending or descending inclines, of breaking the surface level of the water into a series of levels or steps, and to prevent the displacement or flow of a greater portion of the water towards one or other end of the boiler.

[*Printed*, 1*s*. *Drawing*.]

A.D. 1864, December 17.—No. 3128.

SALMON, Peter. — (*Provisional protection not allowed.*)— Traction engines, &c.

There is "a superheating flue or flues in the upper portion " of the Cornish boiler with vertical tubes in them." "The " present locomotive or traction boilers or others," "or a " serious of these combined" may be employed " as steam or " air expanders or superheaters" or "receivers of high " pressed steam or compressed air, gas, or water, or a mixture " of these elements" which are "supplied" from "stationery " steam boilers, hydrolic or forcing apparatus, or engines at " suitable stations before starting and on the line of rout." Air pumps and condensers are fitted to the engine. "The " composition for boiler" is placed "in a bag" and suspended " under the water level." An "electoral embrage," "being " a communication with wires worked by electricity, spring, " and lievers" is used "for supplying water to the level re- " quired and in announcing by an alarm bell every cause of " danger." The wheels may have "oselating axles," and a " spoked wheeled stearing apparatus" is connected to the axle of the front wheels.

[*Printed, 4d. No Drawings.*]

A.D. 1864, December 28.—No. 3223.

BLANCHET, Aristide Paul.—(*Provisional protection only.*) "Application of steam power to the cultivation of land."

A locomotive is described which advances forward a short distance over the field, and anchors itself by a prop forced into the ground. It then winds up a rope which draws a plough up to it, this rope having been allowed to run out during the forward progress of the apparatus. On a strong iron framing is a boiler with two cylinders placed inclininglv on each side of the fire-box. On the crank shaft are loosely mounted three chain pinions, which are caused to revolve when made fast by clutches. Two large iron hind wheels with broad felloes, and two of smaller dimensions in front support the frame. Upon the axle of the hind wheels is fixed a chain wheel, embraced by an endless chain, which passes round the centre chain pinion on the crank shaft, thereby giving motion to the main axle and driving wheels; the latter are arranged to act either together or separately, and when the engine is not required to travel, are thrown out of gear. The centre of the fore axle is pivoted to the framing for the purpose of steering, which is effected by apparatus manœuvred by means of a winch under the control of the engineer, whereby the wheels are turned in the required direction. A winding drum is mounted upon a transverse shaft, towards the back of the machine, supported by the back framing, a chain wheel is fixed on each end of the drum shaft, which by means of endless chains which embrace the two chain wheels thereon, and the two outer chain pinions on the crank shaft, is set in motion and rotates the drum, whereon is wound a wire rope, the free end of which is fixed to the plough or other cultivating implement. As the onward progress of the implement and of the engine alternate, a propping apparatus is attached to the after part of the framing. When the engine is moving forward the drum shaft is free, and the rope is unwound by the backward drag of the implement until a sufficient length is paid out; by means of the clutches the driving wheels are then thrown out of gear whereby the further advance of the engine is stopped, and the drum shaft is then thrown into gear by the respective movements of the pinion clutches; the drum then begins to revolve, and wind on the rope, whereby the implement is again drawn towards the engine, operating in its course upon the land. The retrogression of the engine in consequence of the strain upon the rope is prevented by the trailing props.

[*Printed, 4d. No Drawings.*]

1865.

A.D. 1865, January 31.—No. 271.

HENRY, MICHAEL.—(*A communication from Auguste Bernier and Hyppolite Louis Godard Desmarest.*)—" Locomotion or " propelling on land."

The inventors propose to drive a traction engine by means of propelling legs or pushers acting against the ground. These legs are mounted on crank shafts under the body of the engine and receiving motion from the engine through spur gearing. Two such shafts are used, each carrying four legs. The legs work between the bars of frames by which they are guided. Stops on the bars regulate the inclination at which they strike the ground. There are two frames, one on each side, and by raising them the legs are lifted out of action. By raising the frame on one side the steering is assisted. For backing the engine the legs are raised, and another pair, set so as to work in the opposite direction, let down into action. The legs may be jointed, and may be fitted with feet " of a shape like that of a horse's hoof, slightly convex at the " middle." The engine is supported by a pair of large wheels behind and a pair of small wheels in front, fitted with steering gear.

[*Printed*, 8*d*. *Drawing*.]

A.D. 1865, February 6.—No. 321.

MARKHAM, Clements Robert.—(*A communication from William Graham McIvor.*)—Various applications of springs.

Amongst other applications the use of springs is proposed to drive locomotives and traction engines. Coiled springs fitted to such engines are to be wound up by stationary engines, water power, &c. For equalising the power of the springs fusees may be used, or expanding wheels, the peripheries of which are made in sections capable of fitting on different parts of the spokes. By means of suitable gearing the descent of the engine down an incline may be caused to wind up the springs. Engines of this character are to be used for "performing all the ordinary work of a farm."

It is also proposed to use for such engines wheels with elastic tyres, and a figure of such a wheel is given.

[*Printed*, 2*s*. 8*d*. *Drawings*.]

A.D. 1865, February 24.—No. 522.

HOWARD, James.—" Steam engines applicable to ploughing " and other agricultural purposes."

A " transverse fire-box " is " situate midway of the length " of the boiler." Tubular flues from the fire-box lead to smoke boxes at each end of the boiler. Thence the products of combustion pass through a flue formed by the space between the inner and outer shells of the boiler at the top to a central chimney. The steam dome is above the firebox and within the chimney. The steam pipe (which is fitted with a slide valve) leads from the top of the steam dome through the flue formed by the boiler shells to the cylinders, which are mounted at one end of the boiler. By this arrangement the steam is superheated.

The winding drums of ploughing engines are set at opposite ends of the boiler. They are mounted excentrically on a longitudinal shaft carried by bearings on the boiler shell, so that by turning this shaft they can be thrown in and out of gear. They are each fitted with a ring of internal teeth, into which gear pinions on a horizontal shaft driven by bevel gearing from the crank shaft.

The rim of the steering wheel is fitted with "segment "blades" to counteract side drag. Such blades may also be fitted to the other wheels.

[*Printed,* 10*d.* *Drawing.*]

A.D. 1865, March 20.—No. 780.

MACKENZIE, ALEXANDER RICHARD.—"Locomotive engines "and carriages for common roads and tramways, and also for "agricultural and other purposes."

The driving wheels are on the crank shaft, which is in three portions connected by clutches, so that either or both wheels can be disconnected. The levers working the clutches may be connected to the steering gear so that the wheel on the inside of the curve may be put out of gear in going round a corner.

The products of combustion from the fire are led downwards and discharged through perforated plates into the air; there is a "moveable ash pan, which can be raised or depressed "at pleasure for the purpose of regulating the draught of "air." The exhaust steam is condensed and the water of condensation pumped back to the boiler.

When "compressed air or other motive power is used "instead of steam," the inventor employs "toothed chains "and chain wheels for turning the hind or driving wheels."

[*Printed,* 10*d.* *Drawing.*]

A.D. 1865, March 27.—No. 863.

BRUCKSHAW, John, and UNDERHILL, William Scott.—Traction engines.

The driving wheels instead of having projections on their rims, have "zig-zag or serpentine peripheries" with "the " running surface," "flat and in a line concentric with the " axle." The rim may also be "sunk with a groove."

The engine is steered by means of a rod jointed to the front axle near one end, and extending back to the foot-plate at the back, where it is fitted with a rack engaging with a pinion on the axle of the hand steering wheel. The rod is cranked or bent "so as to allow the nearest locking wheel" " to be locked."

[*Printed*, 10*d*. *Drawing*.]

A.D. 1865, April 5.—No. 962.

ALLEYNE, John Gay Newton.—Traction engines.

The invention relates to methods of imparting motion to the wheels of a traction engine by (1.) worm wheels, and (2.) chain gearing.

1. The cylinders are inclined and drive on to one crank shaft, which is in three lengths, connected by Hook's joints. The third length of the shaft has on it a worm which gears with a worm wheel on the axle of the driving wheels. The worm is "of such a pitch as just to be capable of being made " to revolve by the worm wheel, so that the engine is not made " to stop dead when the steam is shut off." The object of the universal joint is to allow for the motion of the wheel axle relative to the crank shaft. The slide valves for both cylinders may be worked from a single eccentric, when both cylinders work on to one crank.

2. The cylinders are over the fire-box, and the crank shaft fixed on top of the boiler. A chain wheel on the crank shaft drives a similar wheel on an intermediate shaft, which drives a chain wheel on the axle. This last wheel is loose on the axle, but can be clutched thereto. A pulley on its boss transmits motion through a train of spur wheels to a pinion, also loose on the axle, but capable of being clutched to it. By allowing one of the above wheels to run loose and clutching

the other to the axle either of two rates of speed can be imparted to the axle.

[*Printed,* 1*s.* 4*d.* *Drawings.*]

A.D. 1865, April 8.—No. 1002.

GEDGE, William Edward.—(*A communication from Alfred Taillendeau.*)—" Application of steam power to locomotion on " ordinary roads."

A train is formed of a number of vehicles. A steam engine mounted on the first vehicle. The motion is transmitted from the engine to the wheels of the second vehicle and from that in succession to the vehicles behind it by means of bands and pulleys, cranks, and connecting rods, or toothed gearing.

Two modifications of the arrangement are figured in the drawing. In one the motion is communicated by bevel wheels, in the other by cranks and connecting rods.

[*Printed,* 6*d.* *Drawing.*]

A.D. 1865, April 21.—No. 1123.

HALL, Collinson.—" Engines, machinery, and implements " employed in ploughing."

1. On the crank shaft are " a double clutch or two clutches, " one working within the other, the teeth of the clutches " being cut in opposite directions." "When one of the " ploughs or other implements (where two are employed) has " arrived at one end of the field in work, and the other at the " other end of the field out of work, one engine is put in gear " to draw the opposite plough into the ground; and the move- " ment of the rope or chain is communicated to one or other " of the clutches on the other engine whereby a spring or " other appliance connected to a lever gives notice to the " attendant of the second engine that the first engine has " commenced to work, so that he may put his engine in gear " in order to assist the first engine."

2. To move the engine forward after each traverse of the implement, a worm on a shaft rotated by the engine can be put into gear with a worm wheel driving a small chain wheel by means of which the engine is moved forward.

3. Improvements on the " sectional drums," described in No. 658, A.D. 1862. To prevent the links of the chain being

fouled in the "tongues" of the drum, sliding plates fitted in the spokes have a radial motion given them by the action of rollers riding on a central cam, so that they push out the links from the "tongues."

4 and 5. Improvements in implements.

[*Printed*, 2*s*. 2*d*. *Drawings*.]

A.D. 1865, April 22.—No. 1134.

HOWARD, James, and BOUSFIELD, Edward Tenney. — (*Letters Patent void for want of Final Specification.*) — "Motive-power machinery for cultivating land."

1. Method of causing the drum of a ploughing engine to traverse on its spindle, so that the traction rope may be coiled evenly thereon by stationary guide pulleys. The drum is fast on a sleeve which slides on "a fixed shaft that carries the spur "wheel for driving the drum." On the sleeve is a pinion gearing with a spur wheel on "a fixed endless screw shaft." "The boss of this pinion is fitted with a projecting thread "which takes into the endless screw." "The driving of the "drum is effected by the spur wheel before mentioned "through a coupling which allows of the drum being moved "endwise;" "this coupling consists of a slotted bracket "affixed to the wheel, and projecting into the hollow of the "drum. The slot receives an antifriction roller carried by a "pin which projects inwards radially from the periphery of "the drum."

2. Clutch for heavy gearing. The gear wheel is locked to its shaft by means of sliding bolts which engage with projections on the face of the wheel. These bolts may be carried by a rod within the shaft, when the shaft may be hollow, or by a collar on the shaft when this is inadmissible. The rod or collar is moved by a hand lever.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1865, May 12.—No. 1321.

WINDER, Richard.—"Agricultural railways, &c."

The invention consists of a moveable railway which is laid down across the field, for an engine to travel on, drawing after it a plough or other implement. After each bout the railway is raised and laid down at a suitable distance for the next traverse. The railway is formed of a single articulated rail carried by jointed longitudinal sleepers. Spiked wheels or grooved pulleys on vertical axes grip this rail between them, the weight of the apparatus being supported by other bearing wheels. At each end of the engine is a frame, capable of being raised or lowered for the purpose of laying the rail in the position required. "The frame is bent or angled at right " angles or nearly so to the side," "and is carried out " laterally to any required distance;" "its outer end is " armed with a friction roller, and the third side of the " triangle forms a shoe, and extends from the laterally pro- " jecting end to the fore part of the triangular frame; the " frame is provided with a travelling wheel, and the shoe " carries friction rollers." "As soon as the first jointed " portion of the rail and sleeper is liberated or freed from " pressure the point of the triangular frame raises the rear " end of the sleeper, when the shoe takes the sleeper and " rail, and so on for each succeeding length of sleeper and " rail until the first length leaves the further end of the shoe, " and the others following in succession are placed in a " straight line assisted by the friction rollers on the lateral " arms of the triangular frame."

The "system of rope or chain traction" described in No. 366, A.D. 1865, may also be employed.

[*Printed, 8d. Drawing.*]

A.D. 1865, July 10.—No. 1821.

BROOMAN, Richard Archibald.—(*A communication from Joseph Alphonse Loubat.*) — (*Provisional protection only.*) — " Steam carriages."

" 1st the power of the engine is transmitted by a chain to the " driving axle, which is provided for the purpose with a chain " wheel, and is straight instead of being bent or cranked. " 2nd, the back wheels are carried by a movable carriage " which permits of their turning on a poll bolt. 3rd, steer- " ing apparatus is fitted at the front and at the back " to guide the carriage according to the curves of the " road; 4th shocks are deadened by caoutchouc packing or " springs interposed between the frame of the body and the " frame which supports the compartments for the passengers " or goods." Steering apparatus may be placed both in front and behind. Segment pieces may be bolted on the wheels to form a flange when the carriage is required to run upon rails.

[*Printed*, 4*d*. *No Drawings*.]

A.D. 1865, July 11.—No. 1836.

KEENE, MORRIS HORSEY.—(*A communicaton from Alexander Keene Richards*.)—"Traction engines."

The first part of the invention relates to a method of preventing the wheel slipping. Between the spokes of the wheel rods are fitted. Each rod carries a stirrup or fork at its lower end of sufficient width to embrace the tyre of the wheel. The rod is set in bearings and is forced out by a spring which yields when the wheel is running over hard ground. The blades may be of any required size, or more than one such blade can be arranged to be fitted to the wheel.

The remainder of the Specification relates to the arrangement of the engine. The engine is carried by a pair of driving wheels and by a pair of fore steering wheels. Motion is conveyed from the crank shaft to the axle of the driving wheels through an intermediate shaft, which is connected by couplings to the crank shaft and to the axle of the wheels, so that the spur wheels are always kept in gear while allowing for the motion of the springs. Gearing for three speeds is arranged, the wheels for either speed being thrown into gear as required by clutch boxes. The bearing wheels are dished; the axles are reversible to allow for wear. The wheels are made with cast-iron naves having recesses to receive wooden spokes. After the spokes are fitted into the nave a plate is bolted on by a number of bolts passing between the spokes. The fore-part of the engine may be fitted with a double purchase crab, which can be used for drawing the engine forward in cases of difficulty, and the crab may also be used for other purposes. The running wheels may be thrown out of gear, and the engine employed for pumping or other work.

[*Printed*, 2*s*. *Drawings*.]

A.D. 1865, August 30.—No. 2234.

JAMES, SAMUEL LAWRENCE.—(*Provisional protection only*.)—Traction engines.

The steering wheels of traction engines are fitted with "teeth, blades, forks, or discs" to prevent slipping. These are arranged so that they can be thrust out when required for use, by means of cams, and drawn back flush when not required.

[*Printed, 4d. No Drawings.*]

A.D. 1865, September 1.—No. 2260.

LAKE, John.—"Tubular steam boilers or generators for "agricultural or other locomotive steam engines."

The invention relates to the application of "flue valves," similar to those described in No. 345, A.D. 1865, to the boilers of traction engines, &c.

A number of fluted conical pieces are mounted on a frame in such a way that when the frame is placed in position at the end of the boiler, the cones enter the ends of the tubes and damp or check the draught through the tubes. The frame is so set that by means of a lever it can be shifted horizontally so as to introduce more or less of the conical pieces into the tubes thus offering more or less interruption to the draught. It is preferred to cast the cones on screw stems by which they are secured to the frame. The frame is made in sections for convenience of cleaning.

[*Printed, 10d. Drawing.*]

A.D. 1865, December 13.—No. 3226.

BOWEN, Pryce William.—(*Provisional protection only.*)— "Apparatus for cultivating land by steam power."

A portable engine for steam ploughing is described. The boiler is vertical. The rope drum is mounted round the lower portion of the boiler and below the frame. It "is supported "by a broad flanged ring or kerb piece." Antifriction rollers are set between the interior of the drum and the exterior of the boiler casing, also between the flange and the under side of the drum; "or the drum may be suspended at its centre by "a pin stud or centre bolt." The engine may be caused to give motion to the bearing wheels as well as to the drum.

[*Printed, 4d. No Drawings.*]

A.D. 1865, December 18.—No. 3269.

BROOMAN, Richard Archibald.—(*A communication from Julien Belleville.*)—Boilers.

The boilers are applicable to agricultural and traction engines as well as to stationary and marine engines. The boiler is "composed of horizontal tubes superposed quin-"cuncially connected with each other by boxes and elbow "pipes, and communicating at their lower and upper "extremities with tubes" which are termed "collectors." The lower collector consists of "a tube of square, rectangular, "or oblong form, from which the generating tubes take their "feed;" the upper collector serves as a steam space. There is "a tube for dividing or equalizing the supply of steam; "this tube is fitted in the interior of the upper collector, "where it should be connected steam-tight with the socket of "the steam outlet pipe, so that the steam in order to escape "outside is caused to become divided by passing through "small holes formed along the upper side of the tube." A superheater is employed "composed of two circulations of "tubes interlacing or crossing each other, and communicating "at one extremity with the upper collector" "and at the "other extremity with a purifier or chest." At the side of the boiler is mounted a cylinder or vessel communicating with the top and bottom of the boiler. A gauge glass of the usual construction is fitted to the side of this vessel. Baffle plates are set in the flue above the upper part of the boiler.

[*Printed*, 3*s*. 8*d*. *Drawings*.]

A.D. 1865, December 23.—No. 3328.

DWYER, Edmund, and MOON, Henry.—"Machinery for "applying water or other fluid as a motive power."

The apparatus described may be applied to carriages for common roads. The carriage is supported by a single leading or guiding wheel, and two hind wheels. The hind or bearing wheels are fixed to a double crank axle, formed in two parts, connected by a clutch-box, so that the wheels are capable of acting independently of each other. "Driving cylinders, "similar to steam engine cylinders, one or more to each "crank," are fixed horizontally upon the carriage. Each cylinder has a piston, with a rod projecting from either side thereof and connected respectively with the plunger rod of a double action pump and the connecting rod of the corresponding crank of the axle.

Each bearing wheel runs within a larger wheel or "annular," the inner periphery of which is fitted with a series of short radial hydraulic cylinders, having pistons or plungers the tops or ends whereof project and form rails upon which the bearing wheel rolls. The hydraulic cylinders of each quarter of the large wheel or "annular" are connected with each other by pipes, but have no communication with the hydraulic cylinders of the remaining quarters except through the nave. Each quarter of the "annular" has two hollow spokes, to connect its series of cylinders with the nave, which is constructed with a diaphragm or vertical partition in the centre, so as to form a double cylindrical chamber, the two compartments whereof are connected by pipes with opposite ends of the "driving cylinder" and with opposite ends of the double action pump.

The above described apparatus appears from the explanation in the specification to be designed to operate as follows:—The weight of the carriage acting through the bearing wheels upon the plungers of the hydraulic cylinders will depress them and expel the water from the cylinders, forcing it through the hollow spokes into the nave of each "annular" (on one side of the diaphragm) and thence to the "driving cylinders," actuating the pistons thereof, and thus through the connecting rods causing the cranked axle and bearing wheels to revolve. The plungers of the double action pumps moving with the pistons of the "driving cylinders" will force water from tanks upon the carriage into the nave of each "annular" (on the opposite side of the diaphragm) and thence through the hollow spokes to the hydraulic cylinders, thus raising the plungers, which will be again depressed as the bearing wheels roll over them.

The patentees explain that modifications may be made; but "the novel mode of communicating force to the motion "wheels by means of a series of yieldings and also of a series "of impacts operating upon the external surface of the "internal wheel at a point behind the vertical line of the axis "thereof, and thus producing a forward motion of the entire hemispherical chamber, formed over the crown of the boiler and communicating with the chimney. The hemispherical chamber "is surrounded and covered by a double jacket or " casing forming an inner and an outer air space" " on the " top of the boiler; these two casings form an inner and an " outer cylindrical box in which is placed on a vertical " spindle a fan with obliquely set blades. The escape steam " from the cylinders passes into a large circular tube placed " horizontally round the top of the boiler between the inner " and outer jacket, and a number of smaller tubes fixed into " this tube reach down between the inner and outer jacket " and dip with their open ends into the feed water which " encircles the lower part of the boiler. When the fan driven " from the crank shaft is in motion cold air is drawn " in at the lower end of the outer casing, and this cold air " passing all round the small vertical tubes will become " partially heated and at the same time cause a portion of " the steam in the said tubes to condense and run into the " feed water. The air is drawn over the edge of the inner " casing into the cylindrical fan box, and by the fan it is " forced down between the inner casing and the boiler and " into the furnace above and below the grate bar. The " fan is loose on its spindle, and when the speed of the " engine is increasing the fan rises, and by so doing raises the " shorter arms of two levers, one of which is connected with " the throttle valve of the steam pipe and the other with a " damper in the funnel."

[*Printed*, 2*s*. 6*d*. *Drawings*,]

A.D. 1866, March 5.—No. 666.

DAVIES, GEORGE. — (*A communication from Isidore Nillus, the younger.*)—" Portable steam engines."

" The boiler is composed principally of a horizontal cylindrical body and a vertical body, the lower part of which " contains the furnace, and which rising considerably forms " a wast steam chest. The interior of the outer casing contains " the furnace, a longitudinal flue, together with fire tubes, " and a smoke box, to which the chimney is connected " externally." The tubes are caused to pass twice through the boiler. The base plate carrying the engine is mounted

A.D. 1866, March 3.—No. 657.

BISCHOFF, John.—(*A communication from Robert Creuzbaur.*) —"Steam cultivators."

A frame carrying a steam engine is mounted on bearing wheels driven by the engine, and has a steering wheel in front. A vertical shaft in the rear carries on its lower end a horizontal wheel, on the rim of which vertical digger blades are mounted. These are pivoted to the rim, and secured each by a wooden pin, which breaks if the blade meets with any impediment. A similar digger wheel is mounted on each side, and these are driven by chains from the first-named. Coulters, or "shares and scrapers" may be used, these last being adjustable. Racks are provided for raising and lowering the digger frames, and by clutching various pinions on the first motion shaft to the same, different speeds can be obtained for the machine. The machine may be used for cutting ditches, one digger frame only being used. There is then an endless chain of buckets, mounted so as to collect and raise the earth loosened by the diggers. This delivers the earth to receptacles on the frame, or to inclined planes which throw it off at the sides. By removing the digger frames, &c., the engine may be used separately.

Various improvements in the engines are described, the first of which consists in overcoming the dead points of the crank shaft of an agricultural engine, actuated by the piston rod of a single steam cylinder. This is effected by attaching a smaller cylinder to the main cylinder, and by means of the small piston rod so acting at the proper time upon a set of levers, that the main crank is thereby pushed over the dead points.

The second of these improvements relates to the construction of the boiler, which is cylindrical and vertically disposed upon the carriage frame. The steam cylinder is inverted and attached to the boiler, which contains a number of pendent water tubes; these tubes are attached to the top of the firebox and reach down to the fire-bed. Concentrically placed within each tube there is a smaller tube for causing a downward and upward flow of the water. From the top of the firebox, a circumposed series of vertical tubes convey the products of combustion through the upper water and steam spaces to a hemispherical chamber, formed over the crown of the boiler and communicating with the chimney. The hemispherical chamber "is surrounded and covered by a double jacket or " casing forming an inner and an outer air space" " on the " top of the boiler; these two casings form an inner and an " outer cylindrical box in which is placed on a vertical " spindle a fan with obliquely set blades. The escape steam " from the cylinders passes into a large circular tube placed " horizontally round the top of the boiler between the inner " and outer jacket, and a number of smaller tubes fixed into " this tube reach down between the inner and outer jacket " and dip with their open ends into the feed water which " encircles the lower part of the boiler. When the fan driven " from the crank shaft is in motion cold air is drawn " in at the lower end of the outer casing, and this cold air " passing all round the small vertical tubes will become " partially heated and at the same time cause a portion of " the steam in the said tubes to condense and run into the " feed water. The air is drawn over the edge of the inner " casing into the cylindrical fan box, and by the fan it is " forced down between the inner casing and the boiler and " into the furnace above and below the grate bar. The " fan is loose on its spindle, and when the speed of the " engine is increasing the fan rises, and by so doing raises the " shorter arms of two levers, one of which is connected with " the throttle valve of the steam pipe and the other with a " damper in the funnel."

[*Printed*, 2*s*. 6*d*. *Drawings*,]

A.D. 1866, March 5.—No. 666.

DAVIES, George. — (*A communication from Isidore Nillus, the younger.*)—" Portable steam engines."

" The boiler is composed principally of a horizontal cylin" drical body and a vertical body, the lower part of which " contains the furnace, and which rising considerably forms " a wast steam chest. The interior of the outer casing contains " the furnace, a longitudinal flue, together with fire tubes, " and a smoke box, to which the chimney is connected " externally." The tubes are caused to pass twice through the boiler. The base plate carrying the engine is mounted upon the boiler by cast iron brackets of sufficient height to prevent much heat being communicated to the boiler. On the back of the slide valve " are placed two register plates " mounted by right and left hand screw threads on a rod " " which receives from another excentric " " a rectilinear " alternating movement; the junction of the rod" "with " the bar of the excentric is effected in such a manner as to " allow it to turn freely on its own axis when it is acted upon " by means of the cross pin " " in order to vary the expansion." The steam pipe is curved " with a view to stop the return of " the condensed vapors into the valve box. It is on the tube " of the valve box where the steam pipe is fitted that the " throttle valve is placed, the opening of which the governor " is intended to regulate."

[*Printed*, 8*d*. *Drawing*.]

A.D. 1866, April 27.—No. 1192.

HOWARD, JAMES, and BOUSFIELD, EDWARD TENNEY.—" Working steam tilling implements."

The invention relates to a method of working two tilling implements simultaneously " on what is known as the " 'double system.' " The implements are worked by two engines, which are placed at opposite sides of the field, and " draw the implements to and from a given line dividing the " field transversely into two parts." If one side of the field is " stiffer than the other, the division line may be drawn " nearer to one or other of the land's ends so as to equalize " the work of each engine." Each engine has two winding drums, " which are geared to the driving shaft independently " of each other, and alternately haul in and pay out the " ropes." The traction ropes are connected to the drums and to the implement and pass the whole distance across the field.

Reference is made to No. 11,034. A.D. 1848.

[*Printed*, 8*d*. *Drawing*.]

A.D. 1866, June 1.—No. 1534.

BURROWS, WILLIAM, and BURROWS, JOSHUA.—(*Provisional protection only*.)—" Locomotive engines for common roads."

There is "a vertical boiler in combination with a horizontal " engine fixed thereto and geared with spur gear to the shaft " of the fly wheel, the fly wheel acting as a brake wheel." The starting and stopping motion is operated from any part of the carriage by an endless chain and suitable gearing. The wheels are "of rolled T-iron, with bar iron spokes and cast- " iron naves." "The boiler is constructed with a conical fire- " box and intersected by tubes, and they are so arranged as " to produce a spiral draught which causes the smoke to be " consumed before any of the gases are allowed to pass out " at the chimney." "The steam is condensed in the water- " tank" "by being blown through wire gauze on to the " surface of the water." The object of this is to prevent the noise of the blast.

[*Printed, 4d. No Drawings.*]

A.D. 1866, June 28.—No. 1728.

CLARK, Daniel Kinnear.—"Locomotive traction engines."

"The principal framing is composed of two parallel longi- " tudinal frame plates of iron or steel." The steering apparatus is arranged on the front part of the frame and the back part is connected by a foot plate and transverse plates. The boiler is an ordinary tubular locomotive boiler. The axle of the driving wheels is forward of the fire box. The weight is for the most part carried by the driving wheels which are fitted with the usual springs and "the vertical play of the " axle boxes or bearings of the driving wheels is controlled " by blocks of vulcanised india-rubber at top and bottom." The cylinders are inclined and are set one on each side near the fore end of the frame. The crank shaft drives a second shaft by means of spur gearing arranged to give two speeds. This second shaft is fitted with differential gearing. The driving wheels may be driven by friction wheels or by pinions gearing into circular racks on the driving wheels. The driving wheels may be driven separately, or the power of both cylinders may be applied to both wheels. Friction couplings may be fitted on the intermediate shaft. For steering, any suitable gear may be employed. It is preferred to use "two screw shafts with screw nuts and links."

"When a worm wheel is employed in steering apparatus " the wheel is made of two similar parts or halves in order

" that when the teeth became worn the wear is compensated " by setting up the parts slightly, so that the parts of the " teeth of one part will come slightly in advance of their " corresponding parts of the other part, and the driving " screws are also formed in two parts to obtain a like result." Sand boxes may be fitted in front of the wheels.

[*Printed*, 10*d.* *Drawing.*]

A.D. 1866, July 2.—No. 1757.

APPLEBY, Charles James.—(*Provisional protection only.*)— " Locomotive and traction engines."

1. "Grooved wheel frictional gearing" is used instead of spur gearing.

2. Different speed wheels are fixed on the same shaft, and when the load has been started by the slow motion the fast speed is thrown into gear without stopping the engine.

3. The bearings of the driving wheels are arranged so that " whatever may be the play upon the springs, the centres of " the gearing wheels and pinions always remain equidistant." To this end the bearings may be "carried by two links " coupled to the supporting springs," or may slide in quadrant shaped horn plates.

4. The engine frame is of sufficient length to receive a truck which can be loaded to give additional traction power.

[*Printed*, 4*d.* *No Drawings.*]

A.D. 1866, July 28.—No. 1957.

PHILLIPS-SMITH, John,—Traction engines.

The first part of the invention relates to a method of preventing the engine running away. For this purpose a ratchet wheel is keyed on the driving axle and a pawl on the frame in such a way as to prevent the axle running backwards. Or two ratchets and pawls working in opposite directions may be employed, in which case the pawl is to be put in gear by hand as required. The second part relates to the arrangements of the engine. The cylinders are bolted on a transverse frame which is carried inside the main framing and below the boiler, All the other working parts are also placed below the boiler. On the top of the boiler is a large steam dome. When these engines are to be used for ploughing, they are fitted with a transverse shaft carrying a drum on each side. This drum is driven direct from the crank shaft by a spur wheel and pinion.

[*Printed*, 1s. *Drawings.*]

A.D. 1866, November 13.—No. 2971.

BROOMAN, Clinton Edgcumbe. — (*A communication from Urbain André Chauveau and Henri Marie Joseph le Nepvou de Carfort.*)—(*Provisional protection only.*)—" Arrangement of " engine for towing or hauling barges and other vessels, " which arrangement of engine is also applicable for other " traction purposes."

" The apparatus consists of a steam generator, from which " the steam issues by a pipe furnished with a cock, which " conducts it to the driving cylinders; these cylinders are " four in number, are coupled in pairs, and form two driving " apparatuses distinct from and independent of each " other; they impart rotary motion to two cranked shafts, " each of which carries a small chain wheel; a chain passes " round each of these chain wheels and round a larger chain " wheel attached to each of two bearing wheels." The two bearing wheels are thus independent. Arrangements are made by which either one can be thrown out of gear or driven in either direction. By this means the engine may be steered. The boiler is on a separate wheel frame pivoted to the back of the frame carrying the engine, or if necessary the boiler may be on the same frame.

[*Printed*, 4*d*. *No Drawings.*]

INDEX OF SUBJECT MATTER.

[The numbers refer to the pages on which the Abridgments commence. The names printed in *Italic* are those of the persons by whom the Inventions have been communicated to the Applicants for Letters Patent.]

Adhesion of traction engine wheels, increasing by use of weights:
- Marsden and Stubbs, 153.

Air and steam engine:
- Tindall, 7.

Air engines:
- Pinkus, 18.
- Pinkus, 21.
- Stenson, 28.
- Longridge, 54.
- Hancock and Hancock, 117.
- Salmon, 168.
- Mackenzie, 171.

Air, supplying or forcing into furnace:
- Watt, 2.
- Dumbell, 5.
- Tindall, 7.
- James, 13.
- Nickoll, 16.
- Anderson, 23.
- Hornsby, 33.
- Balk, 49.
- Lee, 50.
- Chaplin, 72.
- Dorman and Cowper, 92.
- Carter, 102.
- Law and Downie, 143.
- Fowler and Webb, 161.
- Bischoff (*Creuzbaur*), 181.

Anchoring or securing engine:
- Fowler, 52.
- Bray, 58.
- Johnson and Johnson, 74.
- Cope, 159.
- Clark (*Blanchet*), 162.
- Blanchet, 168.
- Howard, 170.

Axles. *See also* Wheels:
- Anderson, 44.
- Adams, 49.
- Robinson, 56.
- Robinson, 62.
- Fowler, Burton, and Clarke, 66.
- Johnson and Johnson, 74.
- Fowler and Burton, 79.
- Hadley, 80.
- Bray and Bray, 87.
- Barrans, 88.
- Aveling, 97.
- Aveling, 101.
- Austin, 106.
- Taylor, 107.
- Romaine, 108.
- Lee and Taplin, 116.
- Wilson, 124.
- Marshall, 125.
- Bray, 127.
- Selby, 130.
- Lee, 132.
- Death, 137.
- Selby, 138.
- Barclay, 139.
- Jones, 141.
- Law and Downie, 143.
- Barclay, 144.
- Morel, 148.
- Alison, 150.
- Adams, 152.
- Morel, 157.
- Cope, 159.
- Tomlinson, 160.
- Lee, 161.
- Payne, 163.
- Henry (*Gellerat et Cie.*), 165.
- Craven and Fox, 166.
- Adams, 167.
- Keene (*Richards*), 176.
- Clark, 184.
- Appleby, 185.

Blast, steam:
- Heaton, Heaton, Heaton, and Heaton, 11.
- Allchin, 39.
- Balk, 49.
- Leach, 119.
- Jones, 141.
- Law and Downie, 143.

Blowers. *See* Air supplying.

Boilers:
- Watt, 2.
- Tindall, 7.
- Heaton, Heaton, Heaton, and Heaton, 11.
- Heathcoat, 12,
- James, 13.
- Gibbs and Applegath, 14.
- Upton, 17.
- Anderson, 23.
- Exall, 27.
- Sager, 28.
- Garrett. 30.
- Exall, 35.
- Allchin, 39.
- Johnson, 40.
- Kelly, 42.
- Johnson, 43.
- Johnson, 44.
- Anderson, 44.
- Maggs, 45.
- Johnson, 47.
- Balk, 49.
- Adams, 49.
- Lee, 50.
- Fowler, 52.
- Fowler and McCollin, 53.
- Holcroft, 56.
- Robottom, 60.
- Fulton and Etty, 61.
- Anderson, 61.
- Anderson, 70.
- Anderson, 75.
- Blinkhorn, 77.
- Smith, 79.
- Romaine, 80.
- Humphrys, 83.
- Taylor, 84.
- Barrans, 88.
- Taylor, 89.
- Savage, 91.
- Dorman and Cowper, 92.
- Burness, 93.
- Thomson (*Blandy* and *Blandy*), 94.
- Longstaff and Pullan, 95.
- Dorning, 99.
- Stirling, 100.
- Carter, 102.
- Clayton and Shuttleworth, 105.
- Austin, 106.
- Travis, 109.
- Rickett, 110.
- Eddington, 110.
- Austin, 112.

Boilers—*cont.*
- Chellingworth and Thurlow, 113.
- Homersham, 114.
- Aveling and Rawlinson, 116.
- Leach, 119.
- Chellingworth and Thurlow, 121.
- Pullan and Lake, 128.
- Barclay, 134.
- Lee, 135.
- Lee and Lee, 140.
- Law and Downie, 143.
- Roberts and Roberts, 144.
- Howard, Bousfield, and Pinney, 146.
- Morel, 148.
- Brooman (*Pierret and Schweizer*), 150.
- Howard, Bousfield, and Pinney, 154.
- Turner and Turner, 161.
- Adams, 166.
- Howard, 170.
- Lake, 177.
- Brooman (*Belleville*), 178.
- Bischoff (*Creuzbaur*), 181.
- Davies (*Nillus*), 182.
- Burrows and Burrows, 183.

Boilers, preserving water level in. *See* Water level.

Brakes:
- Reynolds, 8.
- James, 13.
- Church, 16.
- Lovely, 39.
- Bentall, 46.
- Ford, 48.
- Wagstaff, 69.
- Johnson and Johnson, 74.
- Giles, 78.
- Austin, 112.
- Chellingworth and Thurlow, 121.
- Barclay, 134.
- Barclay, 139.
- Law and Downie, 143.
- Barclay, 144.
- Morel, 148.
- Morel, 157.
- Adams, 166.

Brakes, utilising power expended on:
- Rolfe, 147.
- Rolfe, 150.

Carriages. *See* Frames.

Cart, mounting engine in:
- Johnson, 40.
- Johnson, 43.

Casing and covering in engines:
Tuxford, 33.
Allchin, 39.
Bentall, 46.
Taylor, 102.
Holland, 137.

Chains, regulating tension of. *See* Tension.

Chimneys:
Bacon, 15.
Allchin, 39.
Maggs, 45.
Balk, 49.
Chaplin, 72.
Blinkhorn, 77.
Dorman and Cowper, 92.
Travis, 109.
Aveling and Rawlinson, 116.
Barclay, 134.
Lee, 135.
Howard, 170.
Davies (*Nillus*), 182.

Clutches:
Dumbell, 5.
Kyle, 50.
Hall and Charlton, 63.
Massey, 64.
Chandler and Oliver, 76.
Travis, 109.
Hancock and Hancock, 117.
Savage, 139.
Riddell, 145.
Howard, Bousfield, and Pinney, 146.
Mackenzie, 171.
Hall, 173.
Howard and Bousfield, 174.

Compound engines:
Wenham, 106.
Syrett, 111.
Selby, 138.
Morel, 157.

Compressed air, use of. *See* Air engines.

Condensers:
Watt, 2.
James, 13.
Nickoll, 16.
Clarke and Motley, 29.
Exall, 35.
Lovely, 39.
Anderson, 44.
Carter, 102.
Rickett, 110.
Allen, 156.
Fowler and Webb, 161.
Bischoff (*Creuzbaur*), 181.
Burrows and Burrows, 183.

Connecting mechanism for communicating motion to bearing wheels:
Watt, 2.
Fourness and Ashworth, 3.
Lester, 8.
Heaton, Heaton, Heaton, and Heaton, 11.
James, 13.
Bacon, 15.
Church, 16.
Nickoll, 16.
Upton, 17.
Anderson, 23.
Barrat, 26.
Clarke and Motley, 29.
Cooper, 32.
Hippisley, 41.
Kelly, 42.
Anderson, 44.
Johnson, 47.
Romaine, 48.
Ford, 48.
Hart, 51.
Burrell, 62.
Robinson, 62.
Hall and Charlton, 63.
Brooman, 64.
Fowler, Burton, and Clarke, 66.
Wagstaff, 68.
Wagstaff, 69.
Romaine, 71.
Balderston, 71.
Fowler and Burton, 79.
Taylor, 84.
Burrell, 85.
Wilson, 85.
Bray and Bray, 87.
Barrans, 88.
Dorman and Cowper, 92.
Aveling, 97.
Stirling, 100.
Giles, 100.
Carter, 102.
Taylor, 102.
Austin, 106.
Travis, 109.
Rickett, 110.
Darley, 111.
Austin, 112.
Homersham, 114.
Lee and Taplin, 116.
Leach, 119.
Hawksley, 122.
Lee and Taplin, 123.
Marshall, 125.
Pullan and Lake, 128.
Selby, 130.
Barclay, 134.
Lee, 135.
Lee, 136.
Selby, 138.
Barclay, 139.
Lee and Lee, 140.
Faulds, 140.

Connecting mechanism, &c.—*cont.*
  Aveling, 141.
  Barclay, 144.
  Biddell, 145.
  Hornsby, Bonnall, and Astbury, 149.
  Alison, 150.
  Howard, Bousfield, and Pinney, 154.
  Morel, 157.
  Roberts, 158.
  Tomlinson, 160.
  Lee, 161.
  Clark (*Blanchet*), 162.
  Payne, 163.
  Henry (*Gellerat et Cie.*), 165.
  Blanchet, 168.
  Mackenzie, 171.
  Alleyne, 172.
  Brooman (*Loubat*), 175.
  Keene (*Richards*), 176.
  Clark, 184.
  Appleby, 185.
  Phillips-Smith, 186.
  Brooman (*Chauveau* and *De Carfort*), 186.

Connecting mechanism for driving diggers. *See* Diggers.

Connecting mechanism for driving drums. *See* Drums.

Connecting mechanism for imparting motion to driving shaft, &c.:
  Murray, 4.
  Tindall, 7.
  Barrat, 26.
  Exall, 27.
  Peters, 132.
  Newton (*Dickson* and *Jones*), 142.
  Riddell, 145.
  Keene (*Richards*), 176.

Couplings. *See* Draw-bars.

Crane, for raising implements, &c.:
  Smith, 66.
  Chellingworth and Thurlow, 121.

Cranks and crank shafts:
  Reynolds, 8.
  Exall, 27.
  Exall, 35.
  Anderson, 44.
  Fowler and McCollin, 53.
  Robinson, 56.

Cranks, &c.—*cont.*
  Dorman and Cowper, 92.
  Austin, 106.
  Wenham, 106.
  Travis, 109.
  Rickett, 110.
  Syrett, 111.
  Darley, 111.
  Wilson, 124.
  Peters, 132.
  Selby, 138.
  Barclay, 139.
  Barclay, 144.
  Howard, Bousfield, and Pinney, 146.
  Alison, 150.
  Mackenzie, 171.
  Alleyne, 172.
  Bischoff (*Creuzbaur*), 181.

Crossheads:
  Murray, 4.
  Reynolds, 8.
  Nicholl, 16.
  Exall, 27.
  Carter, 102.
  Payne, 163.

Cylinder, auxiliary:
  Lee, 161.
  Bischoff (*Creuzbaur*), 181.

Cylinders:
  Watt, 2.
  Murray, 4.
  Reynolds, 8.
  Gibbs and Applegath, 14.
  Church, 16.
  Nickoll, 16.
  Exall, 27.
  Garrett, 30.
  Hornsby, 33.
  Tuxford, 33.
  Exall, 35.
  Allchin, 39.
  Clayton and Shuttleworth, 40.
  Johnson, 40.
  Kelly, 42.
  Maggs, 45.
  Balk, 49.
  Fowler and McCollin, 53.
  Chaplin, 72.
  Romaine, 80.
  Humphrys, 83.
  Taylor, 84.
  Thomson (*Blandy* and *Blandy*), 94.
  Longstaff and Pullan, 95.
  Carter, 102.
  Travis, 109.
  Syrett, 111.
  Austin, 112.
  Aveling and Rawlinson, 116.
  Leach, 119.
  Chellingworth and Thurlow, 121.

Cylinders—*cont.*
  Peters, 132.
  Selby, 138.
  Morel, 148.
  Hornsby, Bonnall, and Astbury, 149.
  Allen, 156.
  Roberts, 158.
  Clark (*Blanchet*), 162.
  Payne, 163.
  Blanchet, 168.
  Alleyne, 172.
  Phillips-Smith, 185.

Differential gear:
  Watt, 2.
  Reynolds, 8.
  Heaton, Heaton, Heaton, and Heaton, 11.
  James, 13.
  Gibbs and Applegath, 14.
  Barrat, 26.
  Robottom, 60.
  Fulton and Etty, 61.
  Brooman, 64.
  Wagstaff, 69.
  Chaplin, 72.
  Barrans, 88.
  Dorman and Cowper, 92.
  Rickett, 110.
  Eddington, 110.
  Austin, 112.
  Lee and Taplin, 123.
  Wilson, 124.
  Barclay, 134.
  Lee and Lee, 140.
  Aveling, 141.
  Alison, 150.
  Keene (*Richards*), 176.

Diggers and ploughing machines, engines for:
  Pinkus, 18.
  Lillie, 25.
  Barratt, 26.
  Usher, 31.
  Callaway and Purkis, 32.
  Fowler, 37.
  Kelly, 42.
  Johnson, 44.
  Johnson, 47.
  Romaine, 48.
  Ford, 48.
  Kyle, 50.
  Hart, 51.
  Robinson, 56.
  Robinson, 62.
  Wagstaff, 68.
  Romaine, 71.
  Balderston, 71.
  Romaine, 80.
  Parker, 82.
  Blackburn & Blackburn, 91.
  Carter, 102.
  Austin, 112.
  Wilson, 124.
  Bischoff (*Creuzbaur*), 181.

Draw-bars and couplings:
  Aveling and Rawlinson, 116.
  Barclay, 139.
  Barclay, 144.

Driving bands, regulating tension of. *See* Tension.

Drums, mounting engines within:
  Pape, 35.
  Blackburn and Blackburn, 59.
  Blackburn, 148.

Drums, supporting engine on:
  Reynolds, 8.
  Beadon, 22.
  Sager, 28.
  Usher, 31.
  Chrippes, 38.
  Pope, 55.
  Travis, 109.
  Stevens (*Stevens*), 116.
  Clark and Batho, 152.

Drums, winding, operating:
  Murray, 4.
  Heathcoat, 12.
  Anderson, 23.
  Osborn, 24.
  Lillie, 25.
  Fowler, 37.
  Chrippes, 38.
  Fowler, 52.
  Chandler and Oliver, 54.
  Fowler and Worby, 54.
  Williams, 58.
  Robottom, 60.
  Massey, 64.
  Fowler and Worby, 72.
  Johnson and Johnson, 74.
  Chandler and Oliver, 76.
  Fowler, 77.
  Hall, 81.
  Fowler, Burton, and Greig, 83.
  Wilson, 85.
  Hornsby, 86.
  Savage, 91.
  Blackburn and Blackburn, 91.
  Burness, 93.
  Knowelden and Edwards, 94.
  Fowler, Burton, Greig, Allen, and Worby, 96.
  Beards, 98.
  Chaplin, 101.
  Romaine, 108.
  Eddington, 110.
  Howard and Bousfield, 115.
  Hancock and Hancock, 117.

Drums, &c.—*cont.*
- Romaine, 118.
- Kirby, 120.
- Savory and Savory, 122.
- Yarrow and Hilditch, 125.
- Romaine, 131.
- Alison, 131.
- Fowler, Greig, and Noddings, 133.
- Fowler, 135.
- Roberts and Roberts, 144.
- Howard, Bousfield, and Pinney, 146.
- Hornsby, Bonnall, and Astbury, 149.
- Alison, 150.
- Webb, 151.
- Howard, Bousfield, and Pinney, 154.
- Hornsby, Bonnall, and Astbury, 155.
- Roberts, 158.
- Cope, 159.
- Clark (*Blanchet*), 162.
- Coleman and Morton, 164.
- Blanchet, 168.
- Howard, 170.
- Hall, 173.
- Howard and Bousfield, 174.
- Bowen, 177.
- Fisher, 180.
- Howard and Bousfield, 183.
- Phillips-Smith, 185.

Dynamometer:
- Bentall, 41.

Electric engine:
- Pinkus, 21.

Engines, general arrangements of. For details, *see* other heads in Index.
- Locomotive for drawing ploughs, &c.;
  - Dumbell, 5.
  - Reynolds, 8.
  - Gordon, 9.
  - Clive, 10.
  - Upton, 17.
  - Lillie, 25.
  - Usher, 31.
  - Callaway and Purkis, 32.
  - Johnson, 40.
  - Kelly, 42.
  - Johnson, 43.
  - Ford, 48.
  - Pope, 55.
  - Blackburn and Blackburn, 59
  - Hall and Charlton, 63.
  - Smith, 66.
  - Austin, 112.
  - Leach, 119.
  - Bray, 127.
  - Morel, 148.

Engines, &c.—*cont.*
- Locomotive for drawing ploughs, &c.—*cont.*
  - Tomlinson, 160.
  - Clark (*Blanchet*), 162.
  - Blanchet, 168.
- Portable engines with drums (ploughing engines), with or without locomotive arrangements:—
  - Murray, 4.
  - Heathcot, 12.
  - Anderson, 23.
  - Osborn, 24.
  - Fowler, 37.
  - Fowler, 52.
  - Chandler and Oliver, 54.
  - Fowler and Worby, 54.
  - Holcroft, 56.
  - Williams, 58.
  - Robottom, 60.
  - Massey, 64.
  - Fowler and Worby, 65.
  - Fowler and Worby, 72.
  - Johnson and Johnson, 74.
  - Chandler and Oliver, 76.
  - Fowler, 77.
  - Hall, 81.
  - Fowler, Burton, and Greig, 83.
  - Hornsby, 86.
  - Burness, 93.
  - Fowler, Burton, Greig, Allen and Worby, 96.
  - Romaine, 108.
  - Eddington, 110.
  - Kirby, 120.
  - Roberts and Roberts, 144.
  - Howard, Bousfield, and Pinney, 146.
  - Hornsby, Bonnall, and Astbury, 149.
  - Alison, 150.
  - Webb, 151.
  - Howard, Bousfield, and Pinney, 154.
  - Hornsby, Bonnall, and Astbury, 155.
  - Allen, 156.
  - Roberts, 158.
  - Cope, 159.
  - Clark (*Blanchet*), 162.
  - Steevens, 164.
  - Coleman and Morton, 164.
  - Blanchet, 168.
  - Howard, 170.
  - Hall, 173.
  - Bowen, 177.
- Portable engines with locomotive arrangements. *See also* Traction Engines.
  - Fowler, 37.
  - Hippisley, 41.
  - Hart, 51.
  - Fowler, 52.
  - Holcroft, 56.

Engines, &c.—*cont.*

- Portable engines, &c.—*cont.*
  - Bray, 58.
  - Williams, 58.
  - Burrell, 62.
  - Coleman, 68.
  - Wagstaff, 69.
  - Chaplin, 72.
  - Smith, 79.
  - Taylor, 84.
  - Savage, 91.
  - Taylor, 102.
  - Romaine, 108.
  - Eddington, 110.
  - Darley, 111.
  - Aveling and Rawlinson, 116.
  - Wilson, 124.
  - Roberts and Roberts, 144.
  - Howard, Bousfield, and Pinney, 146.
  - Alison, 150.
  - Howard, Bousfield, and Pinney, 154.
  - Roberts, 158.
  - Lee, 161.
  - Turner and Turner, 161.
  - Craven and Fox, 166.
  - Howard, 170.
  - Hall, 173.
  - Howard and Bousfield, 174.
  - Bischoff (*Creuzbaur*), 181.
- Portable engines without winding drums and without locomotive arrangements:—
  - Murray, 4.
  - Lester, 8.
  - Hornsby, 33.
  - Tuxford, 33.
  - Exall, 35.
  - Maggs, 45.
  - Bentall, 46.
  - Balk, 49.
  - Lee, 50.
  - Fowler and McCollin, 53.
  - Holcroft, 56.
  - Bray, 58.
  - Chaplin, 72.
  - Blinkhorn, 77.
  - Thomson (*Blandy and Blandy*), 94.
  - Carter, 102.
  - Wenham, 106.
  - Syrett, 111.
  - Bray, 127.
  - Peters, 132.
  - Davies (*Nillus*), 182.
- Traction engines;
  - Watt, 2.
  - Fourness and Ashworth, 3.
  - Dumbell, 5.
  - Reynolds, 8.
  - Heaton, Heaton, Heaton, and Heaton, 11.
  - James, 13.
  - Church, 16.
  - Nickoll, 16.
  - Sager, 28.

Engines, &c.—*cont.*

- Traction engines—*cont.*
  - Clarke and Motley, 29.
  - Hippisley, 41.
  - Anderson, 44.
  - Johnson (*Armengaud*), 46.
  - Adams, 49.
  - Lee, 50.
  - Kyle, 50.
  - Bray, 58.
  - Blackburn and Blackburn, 59.
  - Robottom, 60.
  - Brooman, 64.
  - Fowler, Burton, and Clarke, 66.
  - Inman, 67.
  - Wagstaff, 69.
  - Johnson and Johnson, 74.
  - Scotson and Charnley, 76.
  - Smith, 79.
  - Fowler and Burton, 79.
  - Humphrys, 83.
  - Taylor, 84.
  - Bray and Bray, 87.
  - Barrans, 88.
  - Savage, 91.
  - Blackburn and Blackburn, 91.
  - Dorman and Cowper, 92.
  - Longstaff and Pullan, 95.
  - Dorning, 99.
  - Stirling, 100.
  - Giles, 100.
  - Taylor, 102.
  - Clayton and Shuttleworth, 105.
  - Paterson, 105.
  - Austin, 106.
  - Taylor, 107.
  - Travis, 109.
  - Rickett, 110.
  - Austin, 112.
  - Chellingworth and Thurlow, 113.
  - Aveling and Rawlinson, 116.
  - Leach, 119.
  - Simonton, 120.
  - Chellingworth and Thurlow, 121.
  - Hawksley, 122.
  - Lee and Taplin, 123.
  - Marshall, 125.
  - Pullan and Lake, 128.
  - Selby, 130.
  - Lee, 136.
  - Death, 137.
  - Selby, 138.
  - Barclay, 139.
  - Lee and Lee, 140.
  - Faulds, 140.
  - Aveling, 141.
  - Newton (*Dickson and Jones*), 142.
  - Law and Downie, 143.
  - Barclay, 144.
  - Biddell, 145.

Engines, &c.—*cont.*

- Traction engines—*cont.*
  - Morel, 148.
  - Hornsby, Bonnall, and Astbury, 149.
  - Webb, 151.
  - Marsden and Stubbs, 153.
  - Hornsby, Bonnall, and Astbury, 155.
  - Allen, 156.
  - Morel, 157.
  - Roberts, 158.
  - Lee, 161.
  - Turner and Turner, 161.
  - Payne, 163.
  - Henry (*Gellerat et Cie.*), 165.
  - Craven and Fox, 166.
  - Adams, 166.
  - Salmon, 168.
  - Mackenzie, 171.
  - Alleyne, 172.
  - Gedge (*Taillendeau*), 173.
  - Brooman (*Loubat*), 175.
  - Keene (*Richards*), 176.
  - Burrows and Burrows, 183.
  - Clark, 184.
  - Appleby, 185.
  - Phillips-Smith, 185.
  - Brooman (*Chauveau and de Carfort*), 186.

Engines, winding forward:

- Osborn, 24.
- Fowler, 37.
- Fowler, 52.
- Williams, 58.
- Fulton and Etty, 61.
- Fowler and Worby, 65.
- Fowler, Burton, and Clarke, 66.
- Fowler and Worby, 72.
- Fowler, 77.
- Hornsby, 86.
- Wilson, 85.
- Chaplin, 101.
- Carter, 102.
- Romaine, 108.
- Alison, 131.
- Lee, 161.
- Payne, 163.
- Fisher, 180.

Exhaust steam, rendering invisible or silent:

- Anderson, 23.
- Anderson, 44.
- Anderson, 61.
- Anderson, 75.
- Taylor, 107.
- Travis, 109.
- Rickett, 110.
- Leach, 119.
- Chellingworth and Thurlow, 121.
- Barclay, 134.
- Law and Downie, 143.
- Burrows and Burrows, 183.

Expansion. *See* Valves.

Fans. *See* Air supplying.

Feed-water, filtering:

- Allen, 156.

Feed-water, heating:

- Fourness and Ashworth, 3.
- James, 13.
- Allchin, 39.
- Johnson, 44.
- Anderson, 44.
- Johnson, 47.
- Holcroft, 56.
- Robinson, 62.
- Taylor, 89.
- Thomson (*Blandy and Blandy*), 94.
- Taylor, 102.
- Travis, 109.
- Chellingworth and Thurlow, 113.

Fire-boxes:

- Heathcoat, 12.
- Church, 16.
- Upton, 17.
- Hornsby, 33.
- Johnson, 43.
- Anderson, 44.
- Maggs, 45.
- Balk, 49.
- Adams, 49.
- Lee, 50.
- Chaplin, 72.
- Romaine, 80.
- Taylor, 89.
- Dorman and Cowper, 92.
- Thomson (*Blandy and Blandy*), 95.
- Carter, 102.
- Belpaire, 104.
- Austin, 106.
- Rickett, 110.
- Leach, 119.
- Romaine, 131.
- Brooman (*Pierret and Schweizer*), 150.
- Hornsby, Bonnall, and Astbury, 155.
- Mackenzie, 171.

"Flue valves:"

- Lake, 177.

Flues. *See* Boilers.

Fly-wheels:

- Murray, 4.
- Barrat, 26.
- Maggs, 45.
- Bentall, 46.
- Austin, 106.
- Austin, 112.
- Death, 137.
- Lee, 161.

Frames of engines:
  Fourness and Ashworth, 3.
  Dumbell, 5.
  Reynolds, 8.
  Heaton, Heaton, Heaton, and Heaton, 11.
  Gibbs and Applegath, 14.
  Upton, 17.
  Clarke and Motley, 29.
  Exall, 35.
  Lovely, 39.
  Hippisley, 41.
  Balk, 49.
  Kyle, 50.
  Robinson, 56.
  Williams, 58.
  Chaplin, 72.
  Johnson and Johnson, 74.
  Fowler and Burton, 79.
  Hadley, 80.
  Burness, 93.
  Longstaff and Pullan, 95.
  Beards, 98.
  Dorning, 99.
  Stirling, 100.
  Carter, 102.
  Taylor, 107.
  Romaine, 108.
  Eddington, 110.
  Chellingworth and Thurlow, 113.
  Chellingworth and Thurlow, 121.
  Bray, 127.
  Fowler, Greig, and Noddings, 133.
  Barclay, 134.
  Death, 137.
  Law and Downie, 143.
  Barclay, 141
  Roberts and Roberts, 144.
  Adams, 152.
  Stevens, 164.
  Adams, 167.
  Davies (*Nillus*), 182.
  Clark, 184.
  Appleby, 185.
  Phillips-Smith, 185.

Fuel, supplying:
  Tindall, 7.
  Church, 16.
  Exall, 27.
  Blackburn and Blackburn, 59.
  Leach, 119.

Gas engines:
  Pinkus, 18.
  Pinkus, 21.

Gauges:
  Barclay, 134.
  Barclay, 139.
  Barclay, 144.

Governors:
  Garrett, 30.
  Exall, 35.
  Elvin, 69.
  Chaplin, 72.

Gunpowder engines:
  Pape, 35.

Hydraulic engines:
  Palmer, 3.
  Anderson, 23.
  Knowelden and Edwards, 94.
  Dwyer and Moon, 178.

Hydraulic ram used to turn engine:
  Hall and Charlton, 63.

Lazy-tongs propelling arrangement:
  Paterson, 105.

Legs or pushers for impelling traction engines:
  Brunton, 6.
  Tindall, 7.
  Gordon, 9.
  Nicolas, 19.
  Teissier and Triat, 21.
  Sager, 28.
  De Nanteuil, 34.
  Inman, 67.
  Giles, 78
  Taylor, 84.
  Brennand, 90.
  Taylor, 102.
  Henry (*Bernier and Desmarest*), 169.

Liquid fuel furnaces for traction engines:
  Morel, 148.
  Morel, 157.

Lubricating:
  Johnson, 40.
  Chaplin, 72.
  Humphrys, 83.
  Taylor, 107.

Manual power:
  Rolfe, 147.
  Rolfe, 150.

Mercury, reservoir of, used to obtain motive power:
  Johnson (*Armengand*), 46.

Oil, generating steam by burning:
- Morel, 148.
- Morel, 157.

Peat, generating steam by burning:
- Heathcoat, 12.
- Belpaire, 104.

Pipes, systems of, for conveyance of power:
- Pinkus, 18.
- Clarke, Freeman, and Varley, 22.
- May and Leggett, 33.
- Hancock and Hancock, 117.

Pistons. *See* Cylinders.

Plough, fitting auxiliary engine to:
- Pape, 35.

Power, storage of:
- Rolfe, 147.
- Rolfe, 150.

Priming, preventing. *See also* Water Level:
- Gibbs and Applegath, 14.
- Barratt, 26.
- Johnson, 43.
- Hall and Charlton, 63.
- Chellingworth and Thurlow, 113.
- Aveling and Rawlinson, 116.
- Simonton, 120.

Pumps:
- Murray, 4.
- James, 13.
- Nickoll, 16.
- Hornsby, 33.
- Maggs, 45.
- Fowler and McCollin, 53.
- Wagstaff, 69.
- Chaplin, 72.
- Blinkhorn, 77.
- Chellingworth and Thurlow, 121.
- Pullan and Lake, 128.
- Peters, 132.
- Law and Downie, 143.

Pushers for propelling engines. *See* Legs.

Railway, endless, for traction engines and land locomotives:
- Heathcoat, 12.
- Nicholas, 19.

Railway, endless, &c.—*cont.*
- Lillie, 25.
- Hart, 51.
- Cambridge, 55.
- Cambridge, 57.
- Anderson, 61.
- Burrell, 62.
- Robinson, 62.
- Remington and Balcombe, 65.
- Fowler, Burton, and Clarke, 66.
- Inman, 67.
- Anderson, 70.
- Welch, 70.
- Romaine, 71.
- Anderson, 75.
- Scotson and Chandler, 76.
- Fowler and Burton, 79.
- Romaine, 80.
- Thurnham, 82.
- Burrell, 85.
- Boydell, 89.
- Leathy, 90.
- Simonton, 120.
- Gilbert, 124.
- Chapman, 155.

Railway on headlands, &c.:
- Osborn, 24.
- Lillie, 25.
- Winder, 174.

Reaction engines:
- Bacon, 15.
- Exall, 27.
- Stenson, 28.

Reversing gear. *See also* Valves and valve gear:
- Macklin, 151.

Rollers, supporting engines on. *See* Drums.

Rotary engines:
- Dumbell, 5.
- Tindall, 7.
- Upton, 17.
- Nicolas, 19.
- Exall, 27.
- Stenson, 28.
- Johnson, 43.
- Taylor, 89.
- Pullan and Lake, 128.
- Brooman (*Pierret and Schweizer*), 150.

Running away, preventing:
- Phillips-Smith, 185.

Scrapers to clear wheels:
- Kyle, 50.